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EARLY TELEPHONES.

Our readers are familiar with the fact that many authorities on the history of telephony claim that in the instruments invented, described, and constructed by Philipp Reis, of Germany, over twenty years ago, may be found complete and operative speaking telephones. The claims of the Bell patents, practically speaking, are now held by the courts to cover the art of transmitting the sound of words by electricity. All the suits brought by the Bell Company are brought upon this basis, that no speech can be electrically transmitted without infringing their patents. Hence, anything in the shape of an authentic early telephone possesses much interest as tending to deprive this patent of its extraordinary breadth of interpretation.

We here present a number of early telephones, including three general types—the microphone, the magneto, and the magnetization forms. They are from photographs of the original instruments, all, according to sworn testimony, constructed years before Graham Bell thought of applying for a patent for telephones.

Fig. 1 represents the Holcomb instrument. It is a horseshoe magneto, somewhat similar to the well-known Overland Co.'s receiver. It was made by Alfred G. Holcomb in 1860–61. The curved bar in front of the magnet coils is the vibrating armature. The conical ear piece, closed at its larger end with a piece of wood carrying the armature, is designed to concentrate the sound. This instrument talks, and talks well. Its faults are due only to wrong proportions. Its armature is too small, apparently, for the best results. Its results compare with the early speaking Bell telephones.

Holcomb had a friend, George W. Beardslee, with whom he spoke concerning this instrument, and Beardslee undertook to make one himself. Prior to 1865 he constructed the identical instrument shown in Figs. 2 and 3. Its interior construction is shown in Fig. 2. The ideas of Holcomb are, in general, carried out by his friend, who substitutes for the original massive horseshoe magnet one of a different shape, and with that as a basis constructs a regular magneto telephone. This instrument is as operative as the Bell receiver of to-day. The crank seen projecting from its side corresponds to an alarm or calling attachment.

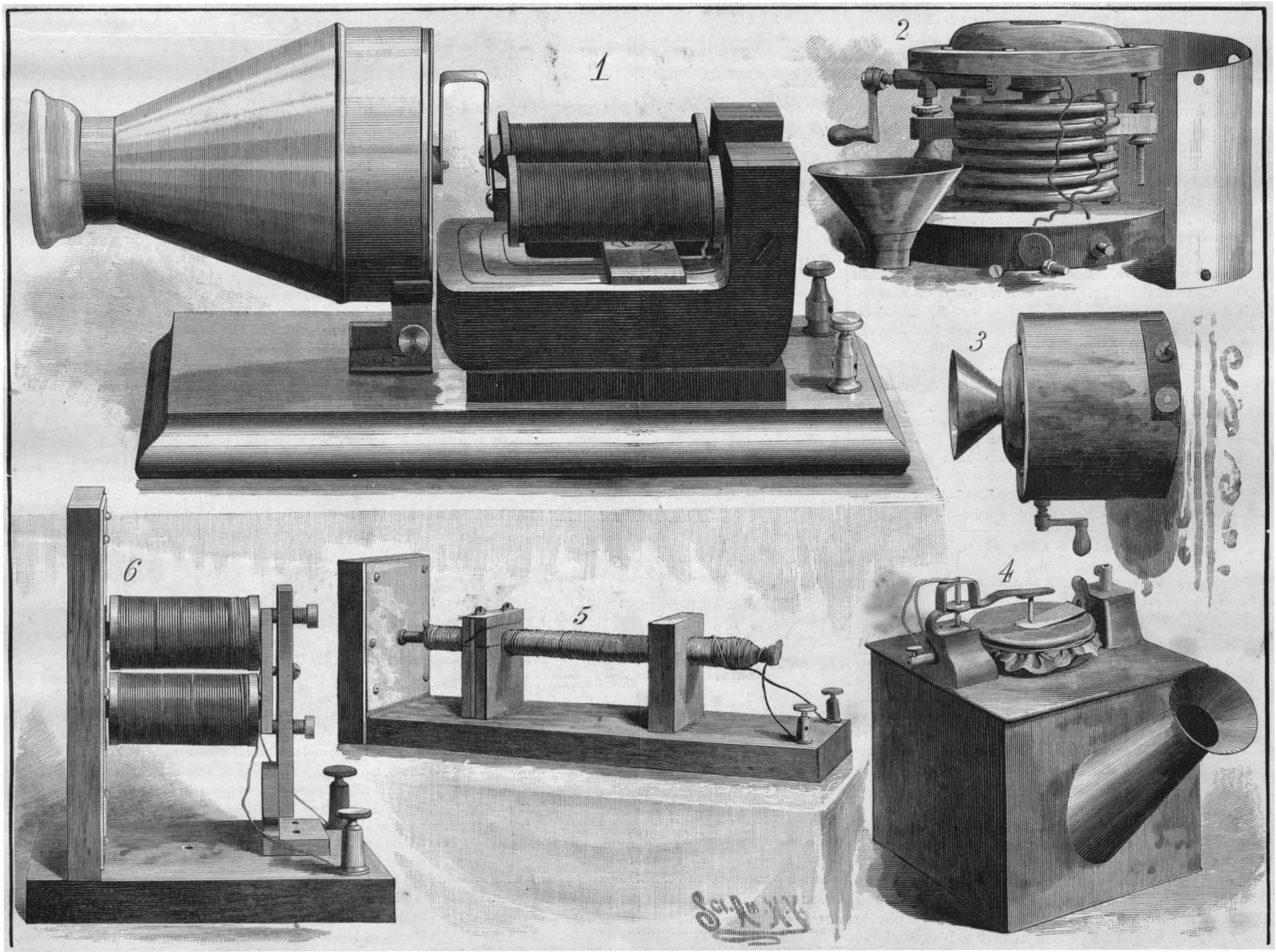
These are two perfectly good magneto telephones, and with some modifications could be used in actual service. In practice it is found that this class is only adapted to perform the office of receivers. For transmitters something stronger is wanted—something that will directly regulate a battery current. This is found in instruments of the microphone type, precisely such as invented and used by Reis, and as constructed in this country by Professor Van der Weyde in 1869. An original transmitter by this inventor is shown in Fig. 4. A rectangular box is fitted with a mouthpiece to be spoken into. Its top has a central aperture covered with membrane that actuates a microphone contact. Couple this instrument with a battery and with any of the magneto receivers shown in our illustration, and we have an operative telephone line such as is in use to-day.

Reis, for receiver, availed himself of the sounds of magnetization. A rod of iron rapidly magnetized and demagnetized undergoes molecular changes, as in length, which are accompanied by slight sounds. The magnetizations are simply effected by surrounding the bar with a coil of wire and passing intermittent currents through it. If by a microphone these currents are made to vary with the utterances of the voice, the magnetization sounds become articulate, and the receiver speaks.

In Fig. 5 we represent such a receiver, constructed about 1869 by Professor Van der Weyde. It is a simple rod of iron surrounded by a coil of insulated wire, with a species of resonating attachment at one end. The great trouble with this receiver is the weakness of its sounds. In the one shown, an attempt is made to re-enforce its vibrations by a species of sounding board or vibrating plate. Reis, we know, adopted similar expedients, sometimes mounting the coil and inclosed rod on a sounding box. Such a coil surrounding a knitting needle gives very pure sounds, and the form is often referred to as the knitting needle receiver.

So pure are the sounds produced by this arrangement, that it has seemed strange that some attempt has not been made of later days to utilize them. A simple wire, surrounded by a coil and carrying on one end a wooden disk to be pressed against the ear, forms a very fair receiver.

Prof. Van der Weyde was not content to rest with instruments of these two types only. A year or so



1. Magneto Telephone made by Alfred G. Holcomb in 1860–61. 2. Magneto Telephone made by George W. Beardslee, at College Point, N. Y., prior to 1865. 3. Same, inclosed ready for use. 4. Telephone Transmitter made by Philip Van der Weyde about 1869. 5. Telephone Receiver made by Philip Van der Weyde about 1869. 6. Telephone Receiver made by Philip Van der Weyde in 1870.

EARLY TELEPHONES.

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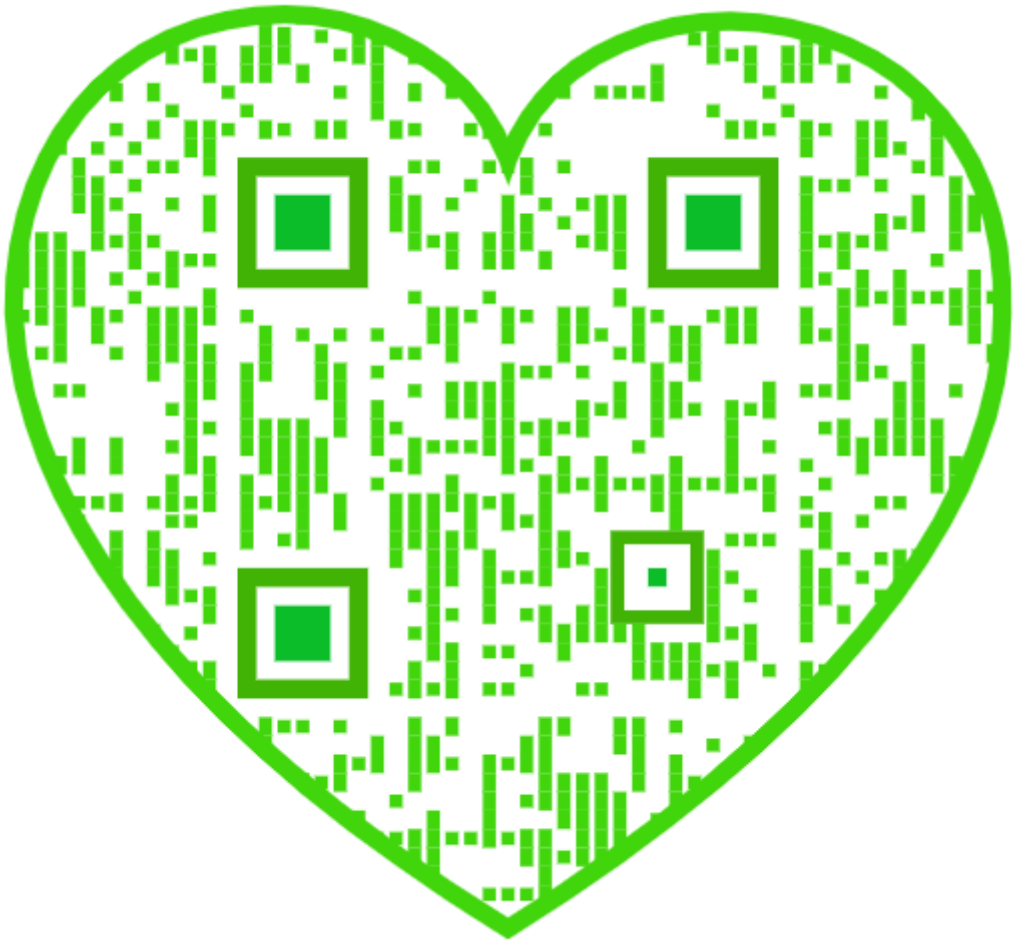

later, in 1870, he made a magneto, shown in Fig. 6. Here we have a horseshoe electro-magnet mounted back of, and facing, a plate armature. It is simply a powerful electro-magneto receiver, something like, but immeasurably superior to, the instruments shown in the Bell patent of six years later. Like all the other instruments shown, it will play its part in transmitting speech. Placed in circuit with a battery and a microphone such as is shown in Fig. 4, it will talk.

Our readers will feel with us that the above represents a most interesting collection of instruments. In many instances, even in suits, alleged anticipating telephones are shown by models. This always casts a shade on their testimony, for the suspicion always exists that some change in construction has been made. It may be so minute as to be indefinable in the light of the testimony concerning the originals, yet enough to change inoperative devices into practical working instruments. Such, at least, is the suspicion that is apt to be aroused by model telephones. But in the instruments here shown we have what are testified to as being instruments actually made fifteen or twenty years ago.

Prof. Van der Weyde originally used his telephones for the transmission of music. He did not at first use them for that of words. Any one who has experimented with early telephones, the Bell included, will find the articulation faint and uncertain at times. In some cases, such is the degree of this uncertainty that we can readily believe that the early workers with untrained ears failed to catch the feeble utterances of their instruments. Every one has noticed a great difference between individuals as speakers or listeners at ordinary telephones. If this is so with the perfected instruments of to-day, *a fortiori* must it be so with the older types. There is a sound sometimes produced by a telephone that is unmistakable—a peculiar buzzing, as if it was on the verge of talking. When that is reached, articulation is only a matter of adjustment. The early workers must often have reached this stage, and failing to recognize its importance, they did not pass it as successfully as we do.

The Reis and Van der Weyde instruments divide themselves into two classes, transmitters and receivers. It is worthy of remark that the practical working instruments of to-day follow the lines indicated by the German school teacher. A battery current is acted on by a transmitter, and the receiver delivers the message. In the Bell patents, magneto or electro-magneto telephones were prescribed for both ends of the line. Any such service is inferior. A microphone is essential at present for transmitter; the Bell instrument is of use only as receiver.

Another interesting feature of the instruments we have described is the fact that they are all American productions. There is always a certain dissatisfaction in looking to Europe for an anticipation. Legally speaking, foreign use does not anticipate; so in the case of Reis' inventions publication has to be shown, and this has to be coupled with the operativeness of the telephones. The inventors whose productions we have just spoken of were residents of America, and did their work here. Most or all of it was done within a few miles of this city. Van der Weyde concentrated his thoughts on the transmission of music; Holcomb felt that his was not sufficiently perfected to be worth patenting, and so their work went for nothing.

It is the old story, so often retold in the history of invention, that the race is to the swift. Bell, by working out a successful telephone company, has succeeded in establishing for himself and associates the most valuable patent of the world. Any of the instruments shown are far in advance of the telephones of his 1876 patent, but unpushed by business energy they passed out of sight, only to be resuscitated as useful aids in combating the claims of the Bell Company.

More Scared than Hurt.

According to *Bradstreet's* careful recapitulation, there are about 43,000 workingmen who are on strike in this country at the present time. The whole number of persons employed in manufactures, mining, trade, and transportation is about 5,640,000. So it appears that not one man in a hundred of those engaged in the industries named has stopped work in consequence of disagreement with employers. But the one striker is making more noise in the land than the ninety-nine workingmen who keep about their business. Trade is hurt more by the apprehension of mischief than by the actual extent of it.—*Phila. Record.*

Origin of Sulphur in Coal.

M. Dieulefait has been inquiring why there is so much sulphur in stone coal, and why there is so little of free alkaline carbonates in the ashes. For this purpose he has analyzed the surviving species of the families of the coal plants, particularly the Equisetaceæ, and has found in them a proportion larger than usual of sulphuric acid. Hence he deduces, as the answer to his questions, that the coal plants were more highly charged with sulphur than most existing plants, and that for that reason their alkaline constituents assumed the forms of sulphates instead of carbonates.

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NEW YORK, SATURDAY, MAY 29, 1886.

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OFFICIAL REPORT ON THE PANAMA CANAL.

M. Rousseau, the delegate appointed by the French Government to inspect the work on the Panama Canal, has made a report which is likely to be more seriously disappointing to M. De Lesseps than was the exceedingly cautious and tentative one of the Hon. John Bigelow, who assisted at the inspection in behalf of the New York Chamber of Commerce, the points of which were summarized in our issue of May 8. M. Rousseau denies the correctness of the canal company's statements respecting its facilities for construction, the time when the canal will be completed, and the amount of money still required to accomplish the work. This appears to be the first public criticism in France of the canal project, the forwardness of the enterprise, and its financial condition, as these matters have been explained by its directors and promoters; and, as a result, it is announced that the Government cannot authorize a proposed issue of lottery bonds, to provide further means to prosecute the work, until the position of the company is made clear. Nearly all the capital thus far subscribed for building the canal has come from people of small means, four-fifths of it being represented by individual sums ranging from $100 to $500. It is thus also that the French national debt is mainly held. To make these small loans popular, the canal company wished to float them with a lottery scheme, but a governmental authorization of such scheme would be a most serious affair in the event of any failure to complete the canal or the interminable postponement thereof, with constantly added cost. De Lesseps may, it is true, succeed in obtaining the necessary funds to keep up work on the canal, notwithstanding this adverse report; but as the calculations of its ultimate cost increase, the difficulty and expense of placing any loans will be augmented, and it seems inevitable that, looking at the project as kindly as possible, the work must drag on for a far longer period than any that has yet been fixed for its completion, even if that is ever accomplished.

GALVESTON HARBOR.

In 1874 the improvement of Galveston harbor was commenced on plans designed by Maj. Howell, U. S. A., approved by a board composed of Generals Tower, Wright, and Newton, U. S. A. The plan contemplated two parallel jetties 12,000 feet or about 2¼ miles apart. They were to be submerged, no part of them being higher than mean low tide, and only a portion of them as high as that. From the shore out for several thousand feet, they were several feet below low tide, thus forming huge gaps to facilitate the flow of the tide to fill the bay of Galveston, a tidal basin about 450 miles in extent. The average rise of the tide is about 14 inches. These jetties were to be built of *gabions*. Each gabion was made of willows in the form of a basket, about 12 feet long, 6 feet wide, and 6 feet deep. This willow structure was plastered over with hydraulic mortar about three inches thick. They were placed end to end in the line of the jetty, and sand was then pumped in them and covers secured on them to keep the waves from washing it out. The jetties were to extend out only to 12 and 13½ feet depth, respectively.

Nearly two miles of the north jetty were built in this way prior to 1880. This entire work was completely obliterated in 1880, and then Col. Mansfield was put in charge. He recommended the building of the jetties with brush mattresses, ballasted with stone in a manner quite similar to the Mississippi jetties, and on substantially the same locations chosen by Maj. Howell. The advisory board was reconvened to pass upon the new plans, and it advised putting down a trial section of mattress work near the outer end of the old north gabionade, and also the changing of the direction of the south jetty, so that its outer end would be distant only about 10,400 feet from the north one, thus destroying the parallelism of the two jetties.

The vigorous prosecution of the south jetty was then begun (1880), and in March, 1884, Col. Mansfield reported it officially as being completed. It was then 4¼ miles long from the shore to 13½ feet water.

About this time the people of Galveston became disheartened, declared that no real benefit had resulted from the works in ten years; and after consultations and meetings, the mayor, city council, and a large number of the chief citizens of the place addressed a letter to Capt. Eads, then in England, to know if he would undertake the improvement on the "no cure, no pay" principle, which he had undertaken to do with the Mississippi jetties. The result was that an offer to do this and secure 30 feet depth of channel was made by him, and was formulated into a bill, which was introduced in the last Congress. It provided for the construction of the necessary works and made the compensation depend upon the securing of a 30 foot channel for $7,750,000.

This bill was vigorously opposed by Gen. Newton and Col. Mansfield, and by others of the Engineer Corps of the army. These two officers, in their official reports to the Senate and House Committees, assured Congress that with $750,000, or less than one-tenth of what Capt. Eads proposed, they could complete the official plan of 1880, and secure a 25 foot channel. A

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letter substantially confirming this was also written by Col. Merrill, U. S. A., and was read in the House by Mr. Bayne, of Pennsylvania, when the measure came up for discussion. The result was that it was defeated, but no appropriation to complete the works was carried in the river and harbor bill at that session, for the reason that Capt. Eads had previously reviewed before the committees the features of the government plans, and had convinced those committees that even if the works were completed, they had four radical defects in them, either one of which would defeat the object in view: 1st. The enormous width between the jetties. 2d. They were too low, and should be carried up several feet above high tide, to prevent storm waves from injuring the channel by carrying sand over the jetties into it when the channel was once secured. 3d. The openings left between the shore and the jetties, to facilitate the inflow of the tide into the bay, were wholly wrong in principle, and would prevent the deepening of the channel. 4th. The sea ends of the jetties terminated in water too shallow to secure any permanent depth greater than that at the jetty ends.

Besides these inherent defects, the jetties would not resist destruction by teredo in the clear water at Galveston. To protect the brush from them, the water must contain sediment or mud, as at the Mississippi jetties. He declared that the jetty reported by Colonel Mansfield as completed and substantial was almost wholly destroyed already, and that it required a ten foot pole to reach its remains in many places.

A new board of army engineers was convened during the recess of Congress, 1885, to report upon the Galveston works. The board consisted of Generals Duane, Abbot, and Comstock, and their report has just been published. [Executive Doc. 85, H. R.]

This board does not give Captain Eads the least credit for the unanswerable logic with which he pointed out the errors in hydraulic engineering which their brother officers have made at Galveston, but their report is as complete a vindication of him as his friends could possibly desire. First: The board admits that 61 per cent in the height of the *substantial* and completed jetty of Colonel Mansfield is wholly destroyed already, and that the works must be built of stone and concrete. Second: That the jetties should be 5 feet above mean low tide. Third: That they should extend from the land out to 30 feet of water (about 10¼ miles, or 54,000 feet), and should have no openings in them to let the tide flow into the bay. Fourth: They reduce the original width of the opening—12,000 feet—about one mile, or to 7,000 feet. Fifth: Instead of the guaranteed channel of 30 feet proposed by Captain Eads for $7,750,000, with no money to be paid until after the stipulated depths were secured, their works are estimated to cost $7,000,000, without any guarantee of success. On the contrary, the board says: "This estimate supposes that the money is freely supplied."

Already one million and a half has been almost wholly wasted at Galveston. Two plans have been tried by our army engineers, and now they propose a third. At Charleston we are building submerged jetties on plans of General Gillmore, U. S. A., with precisely such defects as Captain Eads pointed out in those at Galveston. The late board of his brother officers at Galveston says: "The greatest scouring effeet will be obtained, and the greatest security against undermining, by making the jetties tight *and by raising them above high water.*" Had we not better move slowly in these improvements, or expend the money only after *civil* engineers have approved their plans? The House, by a very decided vote, has recently taken away from the Mississippi River Commission the control of the appropriation for the improvement of the Mississippi, and has lodged it with the Secretary of War. General Gillmore is President of the Mississippi River Commission, and General Newton is the chief of the army engineers and the official adviser of the Secretary of War, and the commission is essentially a military one, which the House refuses to trust!

DEEP WATER CANAL TRANSPORTATION.

At the convention held at Utica last August, the friends of the Erie Canal favored the deepening of its waters to nine feet, and the lengthening of its locks sufficiently to permit quicker service and larger business. The cost of these improvements was calculated to be something over a million dollars. The question of asking aid from the National Government, though negatived by the convention, was afterward brought up at Albany. It was finally decided, however, that the State should retain exclusive control of the canal.

In view of this action, Mr. T. C. Ruggles, C.E., presents a number of statistics in support of the cheaper carriage which will result from the deeper water. His arguments have been reprinted by the Union for the Improvement of the Canals of the State of New York.

The Erie Canal was originally four feet deep. Prior to 1866 it was increased to seven feet. It is now proposed to make an increase of from two to three feet, by raising the banks for half that distance and lowering the bottom in the same proportion. Over culverts and aqueducts, the depth will remain as at present. The advantages of a greater depth of water would be in the lessening of the cost of transportation, resulting from a higher rate of speed and the less motive power required. The great difference in cost is due to the less resistance of a deeper body of water and the increased tonnage it makes possible. In 1880, the total tonnage on the canal is placed at 4,774,648 tons and the cost of transportation at $1.001 per ton. This was with a depth of seven feet. It is estimated that with a depth of nine feet the cost would be reduced to 72 cents per ton, effecting an annual saving of $1,333,246, or almost the cost of the improvements. Could the depth be increased to ten feet, the saving would be even greater.

Speaking of the value of deeper water, Mr. Sweet, the present State Engineer, said: "The same boats and same crews, without extra cost, could have carried 650,000 additional tons to tide water." As the result of an actual trip between Buffalo and Rochester, where the canal averages eight feet, Mr. Horatio Seymour, Jr., states that one-third better time was made with one-half the cost than over a like distance where the depth was but seven feet. If such marked differences in cost and speed result from the addition of only one foot of water, there is a strong inducement to make the increase in depth as large as possible, when the improvement is once undertaken. On the Erie Canal, a steamer and consort weigh 130 tons and carry 580 tons, giving 4·4 tons of freight to one of dead weight. On the journey from Buffalo to New York, they require six men to handle them, which equals 97 tons to the man. On the ocean, the average is about 60 tons to the man, but the freight, of course, is a better paying class. It is believed that the deepening of the canal, by permitting a better speed, will attract a more profitable class of freight. The yearly capacity of the canal, with the depth of nine or ten feet, could be made nearly equal to that of the railroads in 1884—22,123,895 tons. Those who have studied the question of canal transportation state that there should be at least two feet of water under horse boats, and that the propellers require even more. On almost any canal at the present time, the track of a propeller can be seen in a long trail of muddy water which has been churned up from the bottom at the cost of large waste of power. On the present seven foot canal, one ton of fuel effects a carriage of 49 miles, while on the Hudson this is increased to 81 miles. A depth of nine or ten feet would produce a marked lessening of this discrepancy, as there would be three feet of water under the bottom of the boat, instead of, as at present, only from four to nine inches. This would greatly reduce the friction, and, therefore, both the fuel and time required by the journey.

THE OREGON DISASTER.

Just how the mishap to the Oregon came about is not yet known with anything like certainty, though the subject has been looked into by the Wreck Commissioners' Court, London, and attracted no little attention among sailors, landsmen, and marines the world over.

When the various stories of the passengers and crew were compared one with the other, and again with the informal statement of the master of the ship and his first officer, there seemed little to sustain the theory advanced by the latter that the injury to the ship came from contact with the bows of a schooner, and inferentially that it was one of those casualties of the sea which no proper precaution, at least on the part of the officers of the steamer, could have served to prevent. There is evidence to prove that the weather was hazy at the time of the accident, and under such circumstances it is not at all surprising that the officer in command of the deck, unable to see with anything like distinctness, should formulate a theory of the collision leaving the responsibility for the mishap with the stranger. It was pointed out in these columns that, under the prevailing conditions of tide and wind, a coaster would scarcely have occupied the position attributed to the stranger. Bound down the Long Island coast, a sailing vessel with a west by north wind behind her would make a course parallel with that pursued by the Oregon, but in a contrary direction; and if bound into New York, with head wind and tide, or lying at anchor, she would have been tailing the direction from which the Oregon was advancing. This being the case, it was suggested in these columns that nothing ran into the Oregon, but, on the contrary, that *the Oregon ran into the stern* of another vessel, which vessel was either quietly lying at anchor waiting for a slant into New York, or beating to windward, bound for that port.

This view of the disaster seems to be shared by a British contemporary, the *Scottish News*, which is said to echo the opinion held upon the Clyde after a consideration of the evidence as presented to the recent court of inquiry.

The editor says: "The first officer tells us that if the jibboom had been there it would have struck him. Where was it, then? Obviously, at the other end of the schooner; and the fact that Seaman Rogers, looking out on the promenade deck, saw a red light as the schooner passed after the collision, not only destroys the popular theory, but supplies a key to her position. Assuming that the Oregon was struck by the schooner at right angles, she would pivot on her stem, and the Oregon, going at a speed of eighteen knots, would pass her on the starboard side; but Rogers says that he saw a red light as she passed, and therefore she pivoted on her stern. This is an incontrovertible position in itself, but the injury to the Oregon proves it to a demonstration.

"The breaches in her side could not have been made by the stem and anchor, but they are exactly what would result from a counter and rudder. The divers report the first hole 25 feet before the bridge, 18¾ feet at the top and 12 feet halfway down. This hole was apparently above the water line originally, and was made by the first contact, as the counter of the schooner crushed into the Oregon by the impetus of the steamer. The rudder of a sailing vessel would naturally—before this impetus was spent—attack the side of the steamer below the water mark and further aft. Thus we have what the divers describe as a breach 12 feet below the main deck, extending down about 6 feet and 3½ feet wide.

"The Oregon, still steaming ahead, would draw the stern of the schooner with her, and ultimately leave her exactly in a position to show Rogers the red light. This was seen also by Lucey, a seaman who was carrying the mails, and by Wittle, the boatswain. This is the only light that was directly and unequivocally testified to—except the flash light just before the collision; and the chief officer stated that if the Oregon had been overtaking the schooner, the white light only would have been seen. Mr. Rothery's answer to the Board of Trade's thirteenth question, therefore, needs revision. It is fair to admit, in this connection, that the officers say nothing about the anchor or the second blow; these are merely popular rumors; for what would the anchor be doing below the water line?"

The editorial, which throughout deals with the sworn evidence as a judge would, thus emphatically concludes: "We regret that we cannot congratulate the public upon the perspicacity of a court on which it relies for ascertaining the causes of misfortunes at sea. If the efficiency of the mercantile marine depended upon the Wreck Commissioners' Court, the ocean traveling public would be indeed unfortunate."

Removing Fixed Stoppers.

The *Chemist and Druggist* has gathered from various sources a list of well known methods for getting fixed stoppers from bottles, which are well worth preserving in this collated form by every housekeeper.

When a stopper is found to be immovable, it may often be loosened by gripping the neck of the bottle firmly in the left hand, applying the thumb at the same time with a firm upward pressure against one side of the head of the stopper, and smartly tapping the opposite side with the handle of a spatula or other suitable piece of wood. The force should be applied in the direction of the longer axis. The operation may often be expedited by placing a drop of oil or other liquid—according to the nature of the contents of the bottle—on the line at the junction of the stopper and the neck of the bottle; when the stopper is tapped a minute space is momentarily formed, into which the liquid slips, and so gradually gets between the stopper and the neck of the bottle, and allows of the former being easily withdrawn.

Another method is to use a stopper extractor. This can easily be made out of a block of wood three inches square and two inches thick, by cutting a hole through its center large enough to receive the head of a stopper of a forty ounce wide-mouthed shop round. The use of the above is preferable to pulling out two drawers, sticking the head of the stopper between them, and twisting the bottle round, as this latter method has a tendency to mark the shop fittings, which does not improve their appearance. To apply the extractor, it is placed over the stopper and grasped firmly in one hand while the neck of the bottle is held by the other. A gentle, but firm and steady, twisting motion is then used, care being taken to keep both hands moving in the same plane, but in opposite directions. If the pressure be applied too vigorously or spasmodically, or if the lines of the direction of the opposite forces be not quite parallel, there is a danger of wrenching off the head of the stopper or breaking the neck of the bottle. If either or both of these methods fail, the application of heat may be tried. This may either be induced by friction, by means of a string passed once round the neck of the bottle and drawn rapidly backward and forward, the bottle being held fast meanwhile, or it may be applied by dipping the corner of a towel in hot water, squeezing, and wrapping it round the neck of the bottle, and repeating this at short intervals. When the glass has sufficiently expanded, the stopper should be immediately removed, and not be inserted till the bottle has cooled. By one or other of these methods, or a combination of them, together with patience and perseverance, the most intractable stopper may be drawn.

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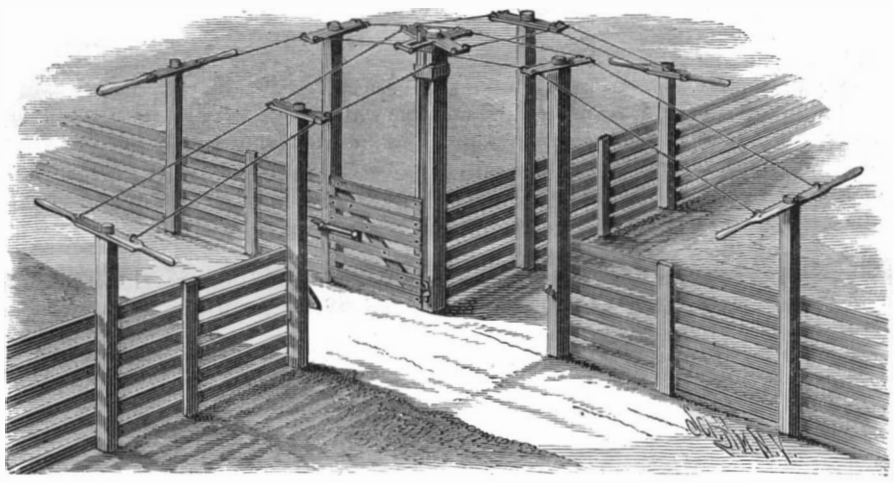
Ozokerite Railroad Ties.

A new and very important application of ozokerite has been recently discovered in Russia; it is now used for making ties in the Transcaspian railroad, which has already passed Oschabat and nearly reached Merv. The process of manufacture is very simple and inexpensive. Kyra, the local name for ozokerite, is found there in thin layers of 7 in. thickness. In its primitive state it contains a certain percentage of decayed matter. To remove this the ozokerite is melted in large caldrons, the refuse sinks to the bottom, and the pure ozokerite collects at the top. This purified ozokerite, melted and mixed with 75 per cent of limestone and 25 per cent of fine gravel, gives a very good asphalt, which is pressed in boxes shaped like railroad ties. Notwithstanding the high temperature, which reaches 48° R. (140° F.), the ties retain their shape and hardness. These asphalt ties are used all along the road, except at the ends and center of every rail, where as yet wooden ties are employed. In this way about $800 per mile are economized.—*From the Russian Monthly Journal of the Ministry of Roads.*

IMPROVED FARM GATE.

Test by actual use has shown that the gate herewith illustrated is not liable to get out of order from any cause, and can be easily operated from a point at any desired distance away. This latter feature makes it especially useful for a pasture gate in a stock raising country, as the herder can drive the cattle before him to the gate, and open it while herding them, without allowing the cattle to scatter off while going round them to open it; and as the gate latches open as well as closed, there is no danger of the stock being frightened, while passing through, by any movement of the gate caused by the wind. In locations where loaded wagons are to pass under the wires leading to the operating levers—by means of which the gate can be swung in either direction—the gate post is made high, as shown in the engraving. The distance of the operating levers from the post does not in any way affect the ease with which the gate can be operated. The lever of a gate now in use is about one hundred feet from the post, and yet the gate can be easily opened and closed by a child. The construction is so simple that it can be understood at a glance. The number of levers depends upon the situation of the gate.

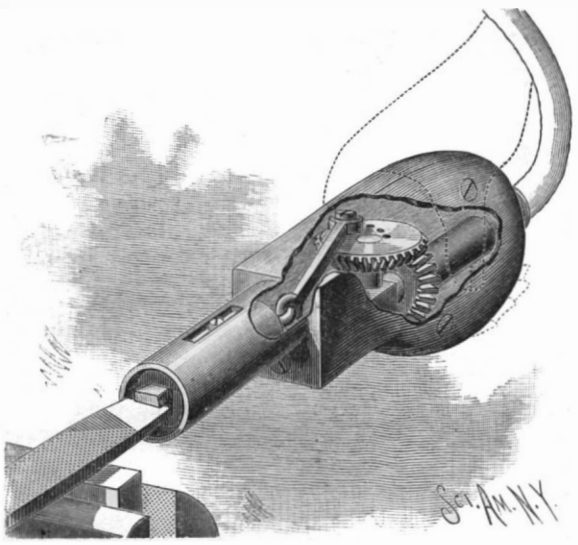


WILSON'S IMPROVED FARM GATE.

This invention, which has been patented by Mr. John G. Wilson, of Cameron, Texas, can be applied to a swinging gate already in use.

AN IMPROVED RECIPROCATING HAND TOOL.

The file, saw, or other reciprocating tool held by this device is guided by the hand to and over any part of the work, such as in file-finishing castings, in fret-sawing, or similar work. Held in the hollow stock by screws is a bearing, to which two beveled gears are so journaled as to mesh into each other. To the horizontal gear is fixed a wrist pin, to which is connected one end of a pitman, the other end of which is connected to a plunger fitted into a tube screwed into the forward end of the stock. The plunger is prevented from turning by a pin projecting into a slot in the tube. One end of a shaft is screwed to a collar on the vertically placed gear, while the other end passes through the rear end of the handle, in which it has a bearing, and is connected with a flexible rotating shaft, which allows the stock to be held in any required position for guiding the operating tool, which can be held to the plunger in any approved way. It is evident that when the shaft is turned, the tool held in the plunger will be reciprocated. The wrist pin may be set in any one of a series of holes in the upper gear, so as to lengthen or shorten the stroke. The plunger can be easily removed, to allow the tools to be more conveniently fixed to it.



KRAYER'S IMPROVED RECIPROCATING HAND TOOL.

This invention has been patented by Mr. J. F. Krayer, of 1542 North 11th Street, Philadelphia, Pa.

Street Cleaning and Garbage Removal in Boston.

For the article under this heading which appeared in our paper of April 3, page 216, we were indebted to *Engineering News*, for which due credit should have been given, but inadvertently was omitted.

For Locomotive Engineers.

How to run a headlight casing without glass. A. If the glass is half broken or there is a hole in it, knock the glass entirely out, turn burner one-third higher, and rain, wind, or snow will not put it out.

When side-tracked, turn down the light, or it will smoke.

How to block a driving or engine truck box when spring is broken. A. Run forward or back wheel on a wedge, block box, and go.

Quickest way to set an eccentric. A. Let fireman catch hold of lugs on eccentric and knock key out of front end of eccentric rod where it connects to link, drop rod, turn eccentric, hold eccentric rod, and let it follow eccentric until rod will go in eye neat, put key in, tighten eccentric, and go, and it will be as true as any machinist can set it.

To explain why pipe from steam gauge to boiler is bent. A. Steam condenses in the bent part and presses against the springs in gauge and keeps steam from cutting springs; the gauge being air or steam tight will not rust. Only, backing up or standing, the gauge pipe will freeze.

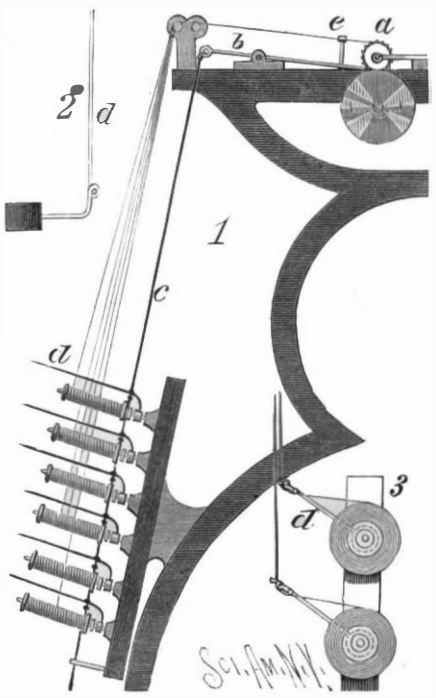
Why is it that water in a boiler running for 20 years don't rust boiler or flues? If you put boiler in water, it will rust boiler out in one year. A. Boiler being air tight, it won't rust on the inside.

Removal of Warts.

A correspondent of the *Therapeutic Gazette* announces through its columns the virtues of castor oil in the removal of warts. Constantly applied for from two to four or six weeks each day—that is, once a day—it has not failed in my hands, says the writer, in any case of any size or long standing. The time it takes may try the patience of the user, but if faithfully used they will get their reward in the removal of the wart without leaving any scar. I have used it with some success in other growths, and had benefit enough to merit further trial. It might, he adds, be a success in the removal of certain kinds of cancer, especially scirrhus forms.

STOP MOTION FOR DOUBLING MACHINES.

The gravity take-up, shown detached in Fig. 2 and in place in Fig. 1, which represents part of a silk doubling machine, is composed of a collar to which is secured a bent wire or rod. The collar fits loosely upon the creel spindles below the spool, and the wire is bent at right angles, so that its long arm stands parallel with and a little distance from the spool. The wire is formed with an eye to receive a cord, *c*, attached to the stop lever or pawl, *b*, for stopping the revolution of the bobbin, *a*, and spindle on which it is placed in case a thread should break. The eyes in the wires prevent the cords from sliding on the take-up arms, thus rendering tangling impossible. The spindles, of any desired number, are held at an angle upon an inclined plate attached to the main frame of the machine. The spools are placed upon the creel spindles so that the threads unwind from the top, and the thread is passed first under the wires, *d*, thence over bars and through the traversing eye, *e*, to the bobbin. In unwinding the thread from the spools, the friction of the spools upon the spindles will cause each thread to lift its take-up about to a level with the thread on the spool, as shown in Fig. 3, so that the whole weight of the take-up comes upon the thread and always holds it taut. In this way a regular tension is kept upon the threads, causing them to be wound with uniform tightness upon the bobbin. Each take-up is connected to the end of the pawl by a cord. When the weight of the take-up is upon the thread, this cord is slack; but in case a thread breaks, the weight of the take-up will come upon the cord, when the pawl will be made to engage with the ratchet wheel and instantly stop the spindle. A single cord may be passed through and knotted below each eye; or in place of a cord, a slight rod may be used.



NIGHTINGALE'S STOP MOTION FOR DOUBLING MACHINES.

This invention has been patented by Messrs. Nightingale Brothers, of Paterson, N. J.

COMBINED NEWSPAPER STAND AND FILE.

Within the tubular post of the pedestal slides a rod which can be held at any desired height by a set screw. The upper end of the rod is slotted to receive a lug formed upon a plate secured to the center bar of the frame. This lug is formed with a projection which permits the frame holding the papers only to come to a level. Passing through the slotted end of the rod and the lug is a clamping screw, by which the frame can be held at any required inclination. The main frame, at each side, is provided with a sliding extension frame, by means of which the file can be adjusted to the size of the newspaper to be filed. The cranks of crank screws, held in the upper and lower parts of the central longitudinal bar of the frame, are made with sharp ends to penetrate the papers easily, and with rounded angles, so that the papers can be readily slipped off and on. The papers are held in place by a bar having grooves formed in it to receive the cranks, as shown in the sectional view, Fig. 2. These grooves are covered with metal plates having short slots formed through their lower parts for the passage of the cranks. The frame and its attached paper can be raised or lowered, and adjusted at any desired inclination to suit the convenience of the reader.

BAILEY'S COMBINED NEWSPAPER STAND AND FILE.

This invention has been patented by Mr. William E. Bailey, of Manchester, Md.

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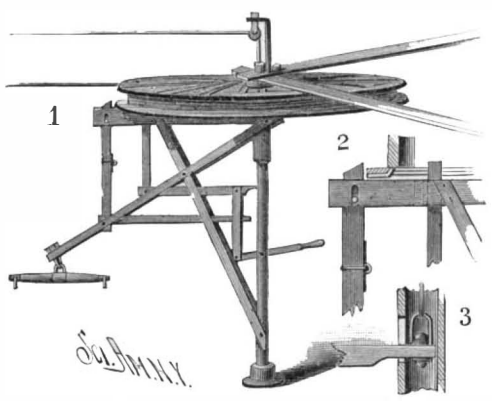
Mysterious Noises.

Apropos of ghosts and haunted houses, the experience of one of the members of the Seybert investigation committee is rather interesting. He is a professor at the University of Pennsylvania, and resides in the suburbs of Philadelphia. At a certain hour each day one of the windows in his house rattles quite violently, and this entirely independent of wind and weather. Naturally, the gentleman was considerably puzzled at the phenomenon, for while there was absolutely no visible cause apparent, each day brought this manifestation of activity on the part of his otherwise quiet window. He determined to discover the cause, and thought at once of the railroad which ran but a short distance from his home. He found, however, that no trains were in the vicinity at that time of day. The recurrence of the noise at precisely the same hour so far impressed him with the belief that it must have a connection with some well observed time-table, that he pushed his investigations further, and included another railroad several miles distant. On comparing his observation with the train schedule, the significant fact was discovered that a heavy train passed a spot within two or three miles of the house at about the same time that the window rattled. Following this clew, he examined the rock formations, and found that an outcropping ledge which received the full force of the train vibrations came to an end immediately under his window. This gave a satisfactory explanation of a phenomenon which in the hands of a less investigative person would have been sufficient foundation for a mild ghost story.

IMPROVED HORSE POWER.

This horse power for hay carriers and other uses is the invention of Mr. John S. Grabill, of Hayesville, O. The lower end of the vertical shaft revolves in a socket bearing attached to the floor. Near the upper end of the shaft, which is made of gas pipe, about one inch and a half in diameter, is loosely mounted a wheel formed with a groove, in which the hoisting rope is wound. The lower hub plate rests upon the inner end of a

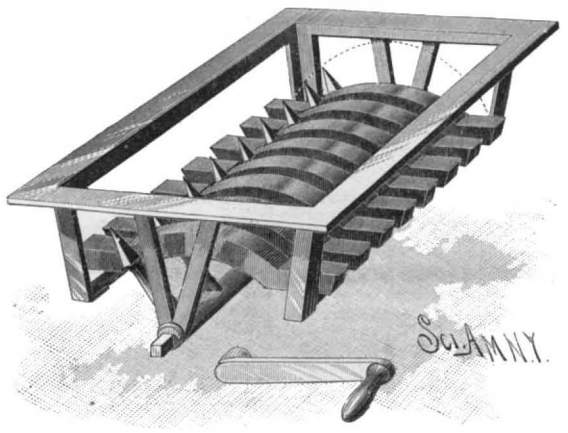


GRABILL'S HORSE POWER FOR HAY CARRIERS.

radial arm, made a little longer than the radius of the wheel. To the inner end of this arm is attached one end of the sweep, which is inclined downward and outward, to bring its outer end into proper position to receive the draught. The shaft, arm, and sweep and its brace form a firm and strong brace to receive the draught and give motion to the wheel. Two brace bars, placed over the upper end of the shaft, hold it in a vertical position. To the outer end of a lever pivoted to the brace is pivoted a vertical bar, made of such a length that when raised its upper end will enter between the spokes of the loose wheel, Fig. 2, and cause it to be carried around with the shaft. To the inner end of the lever is connected by a swivel, as shown in Fig. 3, the end of a trip cord passing up through the shaft, over a guide pulley, and thence to some place where it can be conveniently reached and operated. This lever can also be operated by a hand lever pivoted to the shaft. One end of a right angle lever pivoted to the sweep passes through a slot in the bar, uniting the two levers just described. The other arm of this lever is arranged so as to serve as a brake to check the movement of the wheel when the clutch bar is withdrawn. The weight of the levers holds the clutch bar in gear with the wheel. When the hay fork has been loaded, the trip cord is released, when the clutch bar is raised into gear with the wheel about which the hoisting rope is wound, raising the fork and drawing the hay carrier to the unloading place. After the discharge of the hay, the trip cord is pulled to withdraw the clutch bar, thereby allowing the carrier to run back and descend to be again loaded. The backward movement of the wheel can be checked by the brake.

STOVE GRATE.

The grate bars, shaped as shown in the engraving, are supported upon side bars resting on the lower edges of downwardly extending arms of the fire box. Between the ends of the bars and the bottom edge of the fire box is a space of sufficient height to allow the discharge of cinders. A shaft mounted centrally below the bars is provided with diamond shaped fingers placed in the spaces between the bars. The



BAILY'S STOVE GRATE.

fingers can be moved from side to side by oscillating the crank arm attached to one outer end of the shaft. When resting upon the side bars, the upper ends of the fingers do not extend beyond the top edge of the bars; but when moved toward the center, the ends of the fingers project beyond the top edge of the bars, but do not quite reach to the bottom of the fire box. It will be seen that when the shaft is turned, the sharp edges of the ends of the fingers will easily cut through the fuel on top of the bars, causing the ashes and cinders to fall between the bars or be pushed through the space at the sides, and fall into the ash pit.

This invention has been patented by Mr. M. W. Baily; particulars can be obtained by addressing Messrs. Baily & Baldwin, of Pottstown, Pa.

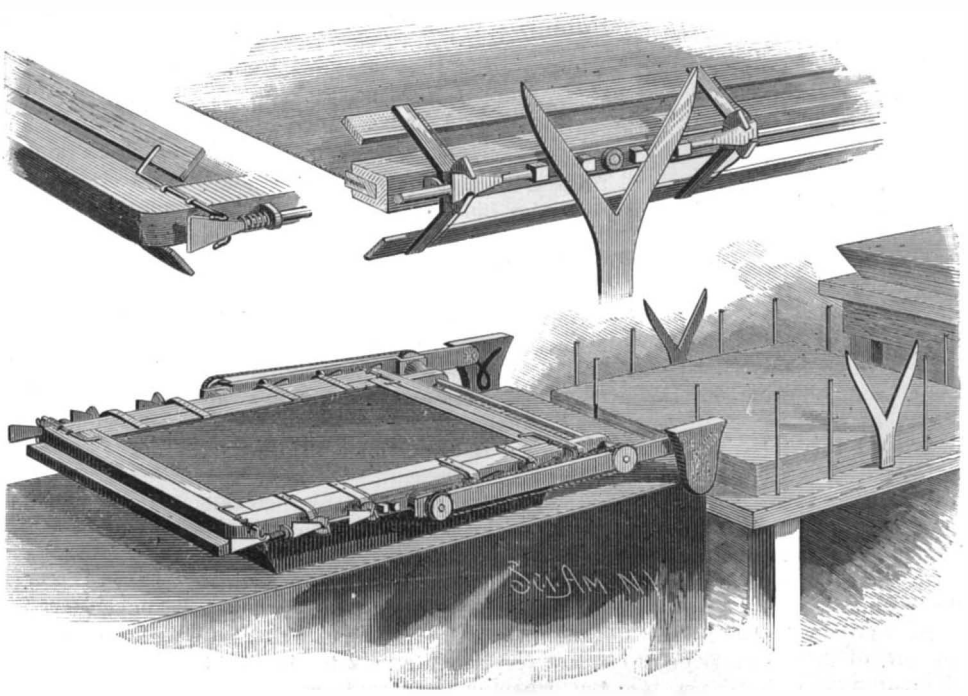
IMPROVED TYMPAN.

Although the tympan shown in the accompanying engraving can be applied to hand cylinder presses, it is especially designed for use with the well known "Washington" hand press. The impression is made on the sheet held by the tympan when in the position shown in the lower cut, the bed plate resting on the carriage, which is on the track plate. On each end of a shaft, held in lugs on the end of the bed, is rigidly held a pulley. Between the lugs and pulleys on the shaft are loosely mounted hubs, formed on bars provided at their ends with pins carrying rollers that work in track grooves, shaped like a letter V having a loop at its bottom, formed on the inner sides of two lugs projecting upward from the end of the track.

The opposite ends of the rods turn on pivots projecting from the outer edges of the side pieces of the tympan at the middle. On the outer end of each pivot is a pulley provided with a pawl and ratchet, that permit it to turn in one direction only. An endless cord passes around the two pulleys on the same side of the frame. As the carriage moves forward, the rollers slide down the tracks in the lugs, swinging the tympan upward. This movement turns the pulleys on the ends of the pivots, and the tympan is swung in a direction contrary to that of the bars; and as the tympan is raised by the bars at the same time that it is being turned, in relation to the bars, in the inverse direction, it is evident that the tympan will remain in a horizontal position, and that the same surface that was presented to the bed will also be presented to the top of the table; in other words, the tympan is not reversed.

As the tympan swings down into position on the table, the prongs of the forks strike lugs of U-shaped pieces and pull them toward each other. This movement causes wedges to enter between the hook ends of levers pivoted to the edges of the side pieces and raise the clamping strips from both sides of the tympan. At the same time the end clamping strips are raised. (The construction of these parts is clearly shown in the upper views.) The printed sheet is thus released and allowed to drop on the table, when a fresh sheet is placed on top of the tympan—on the side opposite the one from which the sheet was just released. When the carriage is moved back, the wedges are withdrawn and the clamping strips are pressed upon the sheet by springs secured to the levers. During this movement, as the pawl and ratchet prevent the pulleys from turning, the tympan swings with the bars, so that that side which was top when the sheet was placed upon the tympan will be swung down upon the bed; that is, the sheet will be under the tympan.

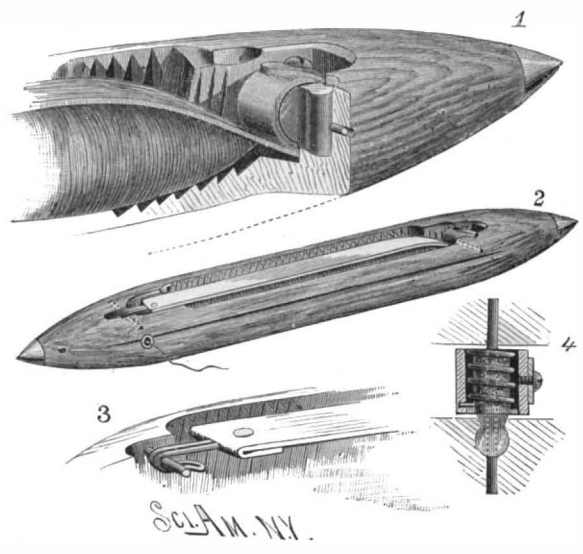
This invention has been patented by Mr. George H. Squier, of Trempealeau, Wis.



SQUIER'S IMPROVED TYMPAN.

LOOM SHUTTLE.

Formed in the shuttle is a chamber for the reception of the cop, which delivers from the end as usual, and is confined in the chamber by a cover strap, and is prevented from slipping longitudinally by the serrations. Usually, the strap consists of a web of elastic fabric secured at one end to the shuttle body, and having at the opposite end a hook to clasp a transverse rod. The



SHAND'S LOOM SHUTTLE.

objection to a strap of this kind is that it is rapidly worn out, and has a tendency to lose its elasticity in a short time. The strap here shown is made of an inelastic material, like leather, and has an elastic connection at one end. This connection, shown in Figs. 1 and 4, consists of a drum mounted on a pin driven through the shuttle and acted upon by a spring. The tendency of this spring is to turn the drum, so as to impart tension to the strap and cause it to bear firmly upon the cop, the drum yielding, however, when it is desired to release the hook (Fig. 3) from the cross bar, in order to lift the strap to remove the cop or insert a fresh one.

This invention has been patented by Mr. Robert Shand, whose address is corner of Alder and Norris Streets, Philadelphia, Pa.

The Inventor of the Telescope.

A long article is contributed to *Ciel et Terre*, in which the writer maintains that the real inventor of the telescope was John Lippershey, a spectacle maker at Middleburg (Netherlands), who was born in Wesel, Germany.

James Metius, who, according to Descartes, has been regarded as the inventor, wrote on the 17th of October, 1608, to the Provinces of Holland, stating that he, *as well as* the spectacle maker of Middleburg, was manufacturing the instrument that brings objects near.

Another document is a petition to the same Provinces from Lippershey for a thirty years' patent. This was refused him the first time because the instrument could not be used with both eyes at once, and a second time (after he had made the instrument double) because telescopes were then being made everywhere.

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A New Form of Stereoscope.*

BY A. STROH.

Although the late Sir Charles Wheatstone's beautiful invention, the stereoscope, gives the appearance of full relief or perfect solidity to photographs of objects seen by it said, the photographs for the same must naturally be of limited dimensions; and though viewed through magnifying lenses, the images of the objects are presented to the eye on a scale far below the size of their originals.

It has therefore occurred to me that if the magnified image of a photograph projected on a screen by the optical lantern could be made stereoscopic, a still greater resemblance to the original might be obtained.

With a view of producing such an effect, I have constructed the apparatus I will now describe, which is, however, not intended to enable a large number of persons to see the projected pictures at the same time, as in the case of dissolving views, but is at present limited to the use of two persons simultaneously. It could, however, be easily constructed so as to be available for a greater number.

The principle of the arrangement depends on the well known effects of the persistence of vision; revolving disks are employed for alternately obscuring two pictures, projected on a screen in the same place, and at the same time interfering with the view of the observer in such a manner that only one picture is seen by the observers' right eyes, and the other by the left eyes.

Two optical lanterns are placed side by side, as for dissolving views. Two transparencies, photographed in the same manner as if intended for an ordinary stereoscope, are placed one in each lantern, and projected on a screen in such a position that they overlap each other as nearly as possible. The picture which is intended to be seen by the right eye may be placed in the right hand lantern, and the other in the left.

Supported by suitable framework, and in the front of the two lenses of the lanterns, is a revolving disk, portions of which are cut away, so that during its revolutions it obscures the light of each lantern alternately, or, in other words, so that only one picture at a time is thrown on the screen. A continuous change from one picture to the other is thus obtained.

In the same framework, and in convenient positions for the observers, two pairs of eye holes are provided, one pair on each side of the apparatus. Behind each pair is also a rotating disk, and these disks are connected by suitable wheelwork or driving bands with the one previously mentioned, in such a way that the three disks rotate together, and at the same rate. The two last-named disks are also so cut that they will obstruct the view through the right and the left eye holes alternately.

Finally, the connection between the three disks has to be so arranged that the time of obscuring the view of the observers' right eyes or left eyes shall coincide with the time when the light is shut off from the right or left lens of the lanterns respectively.

It is obvious that by this arrangement the left eyes can only see the picture projected from the left hand lantern, and the right eyes can only see that from the right hand lantern.

The rotation of the disks must be of such a rate that the alternate flashes of the right and left pictures on the corresponding eyes follow in such rapid succession that the impression made by one flash does not diminish sensibly before the next flash on the same eye is received.

The number of flashes for each eye which is required to produce an apparently continuous view, without any flickering effect, is from thirty to forty per second. As the disks are so cut as to produce two flashes for the right eyes and two for the left in one revolution, they must consequently be kept rotating at a rate of from fifteen to twenty revolutions per second.

The rotation of the disks is effected by a driving wheel and band, worked by a crank handle at the back of the apparatus.

The perspective effect obtained by the above arrangement is very perfect, the image of each object standing out in solid relief.

Considering that by this arrangement the two eyes never see at the same time, and that each eye views its picture after the other, it is interesting to find that the persistence of vision so completely bridges over the alternate interruptions to which it is subjected as to produce the effect of a continuous view.

An unavoidable effect resulting from this arrangement is that by the rotation of the disks one-half of the light produced by each lantern is always cut off; the higher, therefore, the illuminating power used, the better is the result.

This defect is, however, I consider, counterbalanced by several advantages which this form of stereoscope possesses. First, the pictures can be enlarged to such an extent as to appear equal, or even larger, than the original objects from which they were taken; and secondly, the eyes, in looking at the pictures, are not in any way subjected to strain by lenses, prisms, or reflectors, or by the difficulty which some persons experience in getting the two pictures to superpose; for each eye views its corresponding picture in exactly the same position it would see it in if it were looking at the original, since the two pictures are practically in the same place, which is not the case in any other form of stereoscope.

Although with the apparatus as here described only two persons can see the pictures at the same time, it would not be very difficult to construct it so as to be available for a greater number. The side disks above described only serve to control one pair of eye holes each, but by making them a little larger they would serve for two pairs each, thus accommodating four observers. By increasing the number of disks, the number of observers might be increased proportionately.

* A paper read before the Royal Society, April 1, 1886.

Natural History in Philadelphia.

The Zoological Society of Philadelphia has just issued its annual report, from which we learn that a few interesting specimens have been added to the garden the last year. The managers lament the fact that the receipts have fallen off very much, and that the financial condition of the society is not more promising.

Mr. Brown, General Superintendent, says in his report that one of the rarest additions ever made to the collection was a specimen of Whitney's owl (*Micrathene whitneyi*). This miniature of the larger species of the group is hardly larger than a well-fattened English sparrow. It is, in fact, the smallest of known owls, and being an extremely scarce bird, is looked upon with much interest by ornithologists. The limits of its range are not fully known, the few specimens which have been collected coming from Arizona and the adjoining province of Sonora. A pair of them were captured near Tucson by Mr. Herbert Brown, of that city, who kindly presented them to the society. One of the pair unfortunately died during the long journey, and the other lived only a few weeks after arrival.

Through the kindness of Prof. Baird, of the Smithsonian Institution, the society has been able to exhibit one of those rare prizes which have but seldom fallen to its lot, in a tooth-billed pigeon (*Didunculus strigirostris*). This bird was brought from the Samoan Islands—its native region—by the late Dr. Canisius, U. S. Consul at that point, and was by him presented to the U. S. National Museum, and subsequently, with his consent, deposited in the garden, where it has done exceedingly well. Aside from its curious appearance and habits, a special interest is attached to the species, from the relationship which it alone, of existing birds, bears to the strange and almost anomalous pigeon-like dodo, which formerly inhabited the islands of Mauritius and Bourbon, but which is believed to have become extinct within the last two hundred years, and of which no remains now exist except a few bones and feathers in museum collections and a few badly executed drawings in the published works of early explorers.

A Chat about Pumps.

Power, regarding the theory of the action of a suction pump, suggests that a few words relative to the working of pumps may not be out of place. It has been found that by securing a perfect vacuum the water may be raised by suction to about thirty-four feet, when the apparatus is at the sea level, but this involves a perfectly air-tight pump and a heavy atmosphere. In practice, however, it is best not to attempt to lift water more than twenty-five feet, and even this will give trouble when the valves become slightly worn.

In locating a pump, too, it is best to set it as near the source of supply as possible, and to use the least number of elbows and bends that the connections will admit of, and make the suction pipe plenty large; for the flow to the pump, being entirely dependent upon the light pressure of 14·7 pounds per square inch, should be made as free as possible.

In setting up a hot water pump, be sure to put it below the source of supply, or you will involve yourself in endless trouble. Hot water cannot be raised by suction with any degree of certainty. The reason is this: It must be pressed up into the pump by the atmospheric pressure in the tank or heater; and when the water has reached a temperature of 212° F., the steam given off would have when confined a pressure equal to the atmosphere.

Therefore, when the plunger rises and the water is to be pressed into the pump, steam of atmospheric pressure rises instead to fill the pipes and pump, counterbalancing the atmospheric pressure and holding the water at its own level. If the temperature of the water is less than 212°, it will rise a proportional distance in the piping. But if it is warm enough to give off any steam at all, the pump is liable to stop at any time and make all the way from 1 to 1,000 strokes before it will fill again.

Clearance is also a matter that should be carefully considered in selecting a lifting pump. After the pump is once filled, the amount of clearance does not have any very great effect, except as air may be drawn in with the water; but when everything is empty, the pump must act for a number of strokes as an air pump for exhausting the air, not only from the suction pipe, but also from its own cylinder. If the clearance is excessive, the air forms a first-class air cushion, and a great deal of priming will be required before the pump will fill solid with water.

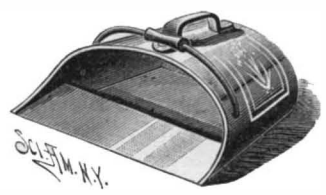
In packing, avoid screwing down too tightly. If this is done, it will cause an excessive frictional resistance, and tend to wear the plunger or piston rod. It is only necessary to screw down tight enough to keep the water from leaking through, but not so that the front of the packing remains dry. If the packing is damp or wet, the water acts as a lubricant upon the plunger, and prevents wear. If a vertical plunger pump is in use, the gland is usually made cup-shaped, so that any leakage through the packing is retained about the plunger, serving to keep it tight. It is well to allow of leakage enough at this point to keep a little water in these cups, as the packing may then be left quite loose, and the pump worked with the least possible friction. Of course, an excess that would keep water streaming down the side of the pump must not be allowed; and in horizontal pumps, any leakage at all is objectionable.

The main difficulty in most places where pumps are either in use or held for reserve is that they receive too little attention. A pump is usually a generous, wholesouled piece of mechanism, that seems to try to pour out the full quota, and when this cannot be done, it will give an occasional gurgle or squirt as though it would say, "I'm doing my best, and I'll be all right soon." So an engineer will fuss and fool around, and talk about a bad pump, and say it's no good, when the trouble lies with him. He would not think of letting his engine get the treatment that is all right for the pump. There will be a neglect to oil or pack or clean, and as for wiping, that does not seem to be thought of in many cases. Then the pump is stuck off in some corner where it is "out of the way," and the suction and delivery pipes are made to crawl all around the walls, under the floor, and across the ceilings; elbows and tees abound, and if the work is put up in warm weather, there is no protection whatever from freezing.

The writer knows of one case where the cold water pump was so located that ten elbows were used between the cistern and the heater; whereas, if the pump had been put directly across the engine room, and been driven by the same line of shafting, three are all that would have been required, besides affording complete protection against freezing; whereas, where they were run, every cold snap means a half day thawing out and all hands idle in consequence. But the pump was put and kept where it would be "out of the way."

DUST PAN.

This dust pan, the invention of Mrs. Hannah V. Shaw, of Lawrenceburg, Ind., is formed with a high cover to catch light dust, and is widened toward the open end for greater convenience in sweeping around the edges and corners of a room. The front of the base is bent to inclose a strip of wood in the form of an angular sill. This strengthens the sill and affords a ready means of taking up dirty water, when scrubbing with a broom, by sweeping the water over the sill into the deep cavity, and then emptying it into a bucket from either side. Upon the cover is a handle, and a bail is secured to the sides. By means of a hole in the back, the dust pan may be hung up and used as a wall pocket. This dust pan will be found to be particularly serviceable during the "cleaning up" operations following a flood.



How to Disappoint a Balky Horse.

The Fitchburg *Sentinel* tells how a Leominster farmer cured his horse of a balky freak by gentle means.

He drove him, attached to a rack wagon, to the wood lot for a small load of wood. The animal would not pull a pound. He did not beat him, but tied him to a tree and "let him stand." He went to the lot at sunset, and asked him to draw, but he would not straighten a tug. "I made up my mind," said the farmer, "when that horse went to the barn, he would take that load of wood. I went to the barn, got blankets, and covered the horse warm, and he stood until morning. Then he refused to draw. At noon I went down, and he was probably hungry and lonesome. He drew that load of wood the first time I asked him. I returned, got another load before I fed him. I then rewarded him with a good dinner, which he eagerly devoured. I have drawn several loads since. Once he refused to draw; but soon as he saw me start for the house, he started after me with the load. A horse becomes lonesome and discontented when left alone, as much so as a person, and I claim this method, if rightly used, is better for both horse and man than to beat the animal with a club."

THE burn produced by nitric acid may be successfully treated by a dilute solution of sulphurous acid.

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Correspondence.

Brooks' Comet No. 1.

To the Editor of the Scientific American:

I see in your SCIENTIFIC AMERICAN of May 15 a description of two new comets claimed by Mr. Brooks of the Red House Observatory, Phelps, N. Y. As to comet No. 1, I claim priority by 9 days, as I, in company with several other gentlemen, saw the celestial visitor through my 4¼ inch objective telescope, April 19, 4 A. M., near the constellation Cassiopeia and on the eastern side thereof, and appearing exactly as illustrated in your paper. Thinking it was the Fabry comet, I did not report it before; but I see by your journal that it was a new comet, as the Fabry comet has a tail, while this one has no tail whatever. I also observed it again April 31, 4:30 A. M.

R. C. BURT.

Chatham, Ontario, May 17, 1886.

Ice Spicules.

To the Editor of the Scientific American:

I have read with much interest your article upon "Ice Spicules," in your issue of February 6. But having had troublesome experience with this stubborn agent, I am led to believe that there are other conditions necessary to the formation of what is called, in common parlance, anchor ice. If not, why is not the Cleveland water tunnel obstructed every bitter cold day or night when the lake is not covered with a sheet of ice?

If the *conditions mentioned* are supposed to *always* produce ice spicules, I think observation will prove the premises to be incorrect. From years of experience with water wheels, I have never been troubled with anchor ice under a cloudy sky at night, or when the sun could be seen by day. Many times has the water wheel been stopped by the passage to it becoming filled with this soft, mushy ice, but never in the daytime or on a cloudy night, however cold. But after becoming obstructed at night, it may remain so during the day, or until the atmospheric conditions change.

Three conditions appear to be necessary to produce this result: water with a smooth surface, biting cold, still air, and a starlit sky.

The atmospheric conditions necessary to produce anchor ice are so infrequent that very little trouble is experienced at the tunnel's strainer, or by the water wheel. I feel quite confident that it is due to certain atmospheric conditions not yet fully understood.

Without doubt, a little warmth applied against the upper side of the tunnel's strainer would remove the trouble.

There are many very singular exhibitions of ice formation noticed by a close observer. One has come to the notice of the writer several times during the present winter, a solution of which he would like to see in your valuable journal.

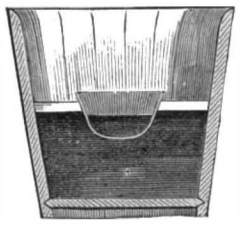
A water pail stood in a cold room half filled with water. On it floated a tin dipper, containing one inch of water. The water in the pail froze to the depth of half an inch or more, while that in the dipper was perfectly free from ice. Query, Why did not the water freeze in the dipper?

C. C. FARRAR.

Flint, Mich.

Our correspondent has given at the end of his communication an account of a phenomenon which might well form the subject of a pretty experiment in a lecture room, and which can, we think, if the conditions are properly observed, be repeated at will. A metallic vessel of smooth interior and exterior floating on the surface of water in a considerably larger vessel of wood, or of material which does not conduct heat readily, and a freezing atmosphere are the conditions.

The level of the water in the metallic vessel will be lower than the level of the water outside of it to an extent depending upon the weight of the vessel and its consequent displacement; and as, when the temperature of maximum density is reached, the colder water in the outer vessel will rise to the top in that vessel, while the water in the floating metallic vessel, being at a distance below this stratum, will be in warmer water, the good conducting quality of the metal will be sufficient to keep its temperature practically equal to the stratum of water surrounding it.



The accompanying diagram will illustrate this.

The metal of the cup being polished, it will be less affected than it otherwise would be by radiation. The more lightly shaded upper stratum of water in the pail is that which has arrived at the freezing point and congealed. The water in the cup has the same temperature—or nearly the same—as that of the same level outside of it. The heavier the cup, the deeper it will sink, and the thicker will be the ice formed in the pail before freezing will begin in the floating vessel.

As to the effect of a clear, still night in promoting congelation, there cannot be any doubt. Water, either in the form of ice, liquid, or vapor, is one of the most powerful absorbers and radiators of radiant heat. Its presence in the atmosphere, in greater or less quantity, obstructs terrestrial radiation into space to such a degree that Tyndall says: "The removal, for a single summer night, of the aqueous vapor from the atmosphere which covers England would be attended by the destruction of every plant which a freezing temperature could kill."

It is well known that clouds are unfavorable to frost.

The bright sun shining into water by day would greatly retard the formation of ice, and this would be the case even though a sheet of ice of considerable thickness had formed. The radiant heat of the sun would warm the ice, and through it the water through its contact with the ice, even though the air might be far below the freezing point of water.

Clouds at night will greatly obstruct the passage of heat from the water into outer space, though the action of connection through the contact of cold air will continue irrespective of this obstruction. But as radiation into space is a most powerful factor in the production of natural ice, and as a clear, starlight night is the very best condition for radiation from a body of water, the formation of spicules would, at such a time, be more rapid.

At the same time, these spicules will tend to rise and mass together at the upper surface of the water, unless sucked down by eddies or currents. We do not believe anchor ice ever formed in a perfectly still mass of water confined in a natural earth basin, though what apparently resembles anchor ice will form in metallic reservoirs exposed upon their surfaces to currents of very cold air. Ice formed in this manner, however, only resembles anchor ice in the fact that it masses below the surface. It is never mushy, and forms solidly, gradually thickening on the sides of the vessel exposed to the cold blast.

We do not see anything in the facts cited by our esteemed correspondent to modify what we asserted in our editorial referred to by him. It is true that water must reach the freezing temperature before ice can form, and it is also true that ice tends to rise to the surface, or rather to form on the surface, of still water. Currents or eddies may carry fine ice down to points below the surface, and keep it there long enough to mass and adhere to stone, timber, etc., and thus, being anchored, it is thereafter "anchor ice" in the full sense of the term.—ED.

Finding of a Great Aerolite.

The finding of the great aerolite which was seen by many persons in Independence township, Washington County, Pa., on the night of September 14, is told at length by the Pittsburg *Dispatch*. About a month after the aerolite was seen and was said to have fallen, Professor Jonathan Emerick, of William and Mary College, began searching for it. His search led him into Butler County, then into Alleghany, and, although he decided that if the stone fell anywhere it must have been near Claysville, he examined very minutely all that region of country lying contiguous to Claysville, extending his researches north and south of that point for about six miles, and also spent some time in wandering through that part of West Virginia lying adjacent to Washington County. On the 15th of this month the savant was rewarded by finding the huge stone on the farm of Mr. Frederick Miller, about two miles north of Claysville. It was lying at the base of a high hill, which is heavily timbered with oak, and was deeply embedded in the soil and almost concealed from view by the dead leaves the wind had blown over it. The discovery was only an accidental occurrence. The Professor, being well acquainted with the geological strata of Western Pennsylvania, was engaged in locating a well for the Claysville Oil Company, and in the discharge of this duty stumbled upon the spot where the immense aerolite lay. It required three men several days to unearth the monster. It had penetrated the earth until it came in contact with a stratum of limestone, when this sudden check of its fearful velocity caused it to break into many pieces of all sizes and shapes; yet when the earth was removed from around it, it still preserved its original shape, so that the Professor was enabled to have a photograph made of it, and it only fell to pieces when the specimen hunters tackled it.

Professor Emerick states that there are only 18 well authenticated cases in which aerolites have fallen in the United States during the last 60 years. Besides these, there are 261 the date of whose fall is reasonably well determined. There are also 74 instances of aerolites in which the date of fall is not given authoritatively. Add to these, 86 masses which, from their peculiar composition, are believed to be aerolites, though the date of their fall is not ascertainable, and we find the entire number of aerolites which have fallen to be about 430.

Professor Emerick says this stone will weigh perhaps 200 tons, being considerably heavier than the aggregate weight of all which have heretofore fallen. On an analysis, it was ascertained that there was in its composition chromium, nickel, aluminum, copper, magnesium, tin, and other metals and metalloids.

It contained 87 per cent of iron, which may be readily worked. This indicates that the stone is not of terrestrial origin; for while iron ores are abundant in nature, iron in the metallic state is exceedingly rare. It also contains in a small quantity a substance called schreibersite, a composition which has never been found except in aerolites. Its specific gravity is 7·412, about twice that of the Guernsey, O., aerolite, which fell on the 1st of May, 1860. The elevation of the aerolite was computed to be about 52 miles above the earth's surface, and its path was nearly horizontal. The length of its visible path was about 150 miles, and it moved from northeast to southwest. The time of its flight was estimated between 5 and 10 seconds, indicating a velocity of not less than 15 or 20 miles per second.

Water Tanks for Fire Purposes.

The necessary expenses for a water tank placed upon a high trestle, designed primarily to supply manufacturing property with water for fire purposes, is frequently asked of special agents of insurance companies. It is a financial problem which will require very different answers, according to the locality and the character of the fire protection required. In one case the necessity of speedy construction and of the employment of a railroad bridge builder added very largely to the expense. The time was winter, the location was three miles from a large town in the southern part of New York, on the Erie Railroad, and the property was a paper mill, just being equipped throughout with automatic sprinklers. The problem was to place a 6,000 gallon tank on a trestle thirty-five feet high, commencing on a stone foundation laid on solid shelving rock. In this case extra strength was desirable, since the tank was exposed to fierce currents of air down a narrow valley. The trestle was built in octagonal form, sixteen feet square at the base and ten feet square at the summit. The sills were six by twelve inches, the posts ten by ten inches, the caps ten by twelve inches, the braces four by six inches, and the deck planks were four by twelve inches. Upon the whole was placed a wooden tank ten feet in diameter and ten feet high.

The bills in detail may some time prove important for reference:

Timber bill in Jersey City	$130 15
Percentages to contractor	27 13
Railroad freight	17 00
Teaming	19 50
Tank, delivered	92 00
Foundation stone, no charge	..
Lime and cement	4 85
Laying foundation	7 50
Bolts and ironwork	29 05
Skilled labor	75 60
Ordinary labor	30 00

This makes the complete cost of the job $432.18. The connection of the water pipes with the tank was included in the contract for sprinkler equipment. By reference to the items, it will be seen that some of the charges were local, but they are given as being very instructive in making rough estimates.

The following quotations were furnished last January to a property owner in Philadelphia, for cedar tanks of 3¼ inch planks, dressed down to 3 inches, and guaranteed of first-class workmanship:

7 feet diameter and 7 feet high	$42 00
8 " " " 8 "	56 00
12 " " " 10 "	125 00
12 " " " 16 "	190 00

—*Insurance World.*

Peppering an Ironclad.

On the 24th of March the obsolete French armorclad Armide was towed to sea in the Juan Gulf and allowed to drift. The Colbert, Amiral Duperre, Friedland, Devastation, Redoubtable, and Suffren, of the French Mediterranean squadron, then steamed about, firing at her at ranges of 3,000, 4,000, and 5,000 meters with 24, 27, and 32 centimeter guns—roughly, 9½ in., 11 in., and 12 in. In time the hull resembled a cullender. Three shots had passed through the armor at the water line, and would have sunk the ship if she had not been filled with casks. The Armide was then towed into harbor, and the effects of the fire carefully inquired into. This probably is the first occasion in which an armorclad has been used as a moving target by ships firing when under way.

Trade Mark Decision.

Royal Baking Powder Co. *vs.* Davis. In this case an injunction was granted in the United States Circuit Court, E. D. of Michigan, Judge Brown, in the opinion, saying: "I do not think the use of the words 'Coral Baking Powder' is in itself an infringement of the plaintiff's trade mark, 'The Royal Baking Powder.' The difficulty is with the similarity of the labels upon which the words are used. The general arrangement of the words being the same, the devices on the cans being very much alike, and the labels of the same color and general appearance, I think purchasers might be very easily deceived into buying one for the other."

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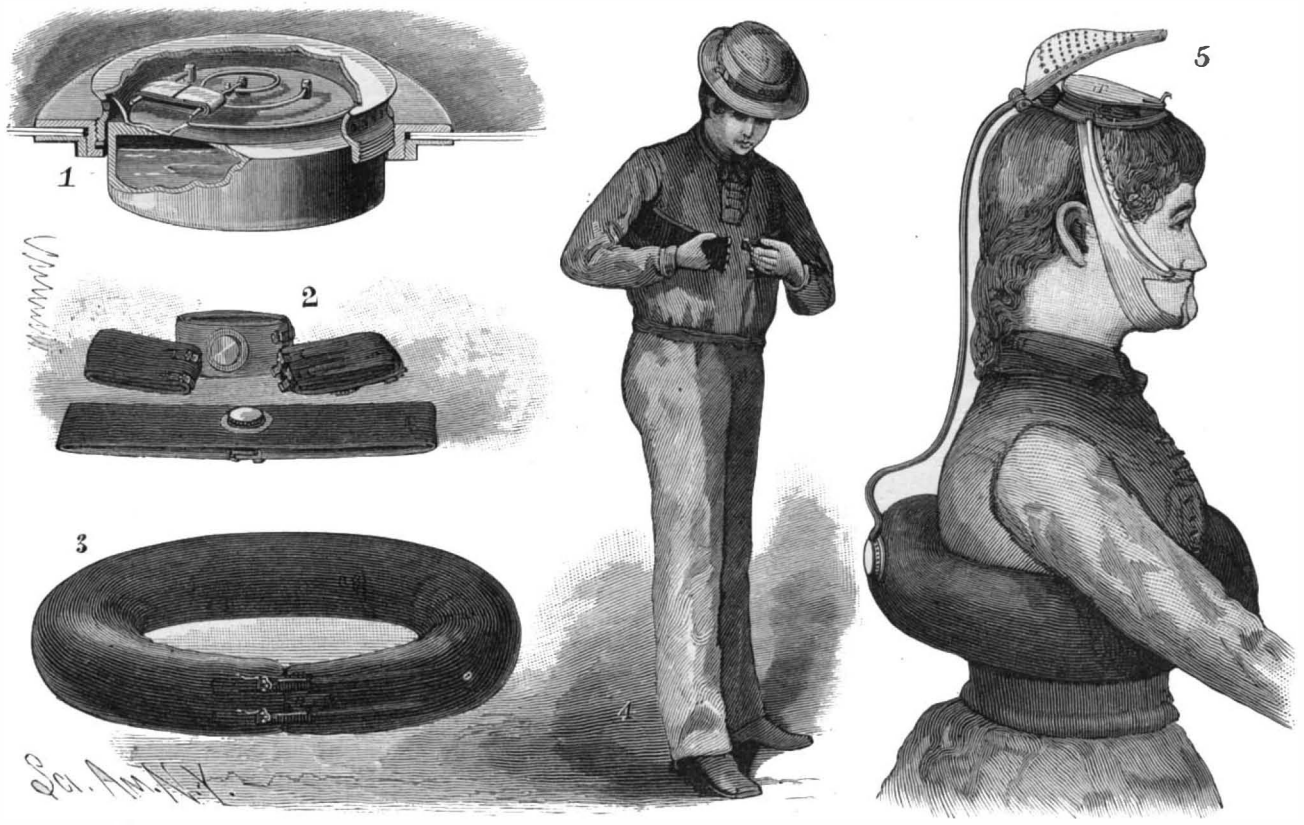
AN IMPROVED LIFE PRESERVER.

The life preserver proper consists of a long and narrow bag made of suitable waterproof material, and provided at the ends with catches, so that it may be passed around the body just below the arms, and the ends united. Secured in one side of the bag is a capsule containing a liquefied gas, such as ammonia. The mechanism for automatically liberating this gas to inflate the bag is held in check by a strip of soluble paper or its equivalent; the wetting of this paper releases the mechanism, which allows the gas from the capsule to fill the bag.

The capsule is cylindrical in form, and has a surrounding flange by which it is held in place by means of a screw cap around the side of which is a row of holes through which the gas escapes. The upper part of a rod passing through a hole in the center of the top is bent to form an arm, which is acted upon by a spiral spring, as shown in Fig. 1. The arm is held against the tension of the spring by a piece of soluble paper. When the capsule is immersed, the water flows through the side holes, wets the paper, when the spring is released and turns the rod to shift a suitable valve upon the interior, which allows the gas to fill the bag. To reach the paper, the entering water has to pass upward and over a curved brim, the object of which is to prevent the band from being moistened, should any drops of water enter the holes at any time when it is not desired to have the apparatus operate.

When the device is applied to a boat, raft, or other large vessel, to give it additional buoyancy in case of accident, the capsule is formed with two compartments, one containing a liquefied gas and the other a combustible powder and a frictionally ignitible preparation for lighting it. The combustion of the powder is an expedient for both liberating the gases and for generating additional gas and sufficient heat to prevent the freezing of the liquefied gases upon the pressure being removed. The liberating mechanism is changed to suit the altered conditions, but the paper band is employed as in the life preserver. When one capsule has been used, another is substituted for it, as is done in charging firearms with cartridges, and the empty capsule is recharged.



BADIA'S IMPROVED LIFE PRESERVER.

The empty preserver is much longer than the breast circumference of the wearer, to allow for the decrease in length when inflated. By means of a suitably arranged rubber strip, the bag is held with a slight tension snugly around the wearer, preventing it from slipping down; but when the bag begins to inflate, the elastic strip, now free, but held by the buckle, moves back toward the end of the preserver, both ends of which meet when the bag is full of gas.

When the preserver is to be worn by a swimmer, its construction is modified so that its action is null except in the event of actual danger. The upper of two thin spoon-shaped plates hinged together is pierced with holes, as shown in Fig. 5, for the passage of water, and is so formed as to leave a space between it and the lower plate for a bellows-like chamber when the plates are fastened together. A band of very elastic and thin rubber passes around the face of the wearer, being fastened on either side of the lower plate. A piece secured to this band is situated under the nose, and connected to pipes communicating with the interior of the bellows. The nose piece is hollow and has two nipples, which enter the nostrils, and in its lower part is a slit through which the air is forced to pass in breathing through the nose. The mouth is uncovered by the band, but when submerged it is covered by a thin rubber piece serving as an automatic valve. From a hollow rubber ring surrounding the capsule, extends a tube to a close elastic ball held at the hinge between the two plates. When the cover plate is brought down to engage with a catch, the ball is compressed, and the air in it is forced through the pipe and made to fill the ring, which closes all the holes in the capsule, thereby preventing the entrance of water.

If the bather should attempt to breathe while the head is submerged, the first inspiration would tend to produce a vacuum in the bellows. This would withdraw the catch to release the top plate, which would rise, when the ball would assume a spherical form, withdrawing the air from the ring, thereby allowing the water to enter the capsule through the holes. The apparatus is automatic, and its action depends only on the very acts a person would instinctively perform in case of danger.

This invention has been patented by Mr. Joseph S. Badia, of 327 Pine Street, Philadelphia, Pa.

This device may be used with advantage to save a drowning person who cannot be quickly reached by a boat, since it may be thrown to a considerable distance. The fact that the preserver does not expand or fill until it has been submerged enables it to be put into a very small compass and thrown by hand, by a sling, or a catapult almost any distance.

A SUBSCRIBER writing from Orlando, Fla., describes a magnificent lunar rainbow which he observed there not very long ago. It was seen at 3 o'clock A.M., in the east. The arch is described as being very perfect and the spectacle magnificent.

IMPROVED AIR ENGINE.

This engine derives its power from an alternate pressure of air contained below the working piston for the out stroke, and a partial vacuum for the return stroke. These different conditions are produced by changing the temperature of the air above and below a certain average temperature, which at any given time corresponds to the atmospheric pressure. When the temperature rises above this point, it gives a pressure correspondingly above that of the atmosphere, whereby the piston is forced up, and when the temperature falls below this average point, then the pressure within the engine falls below the atmospheric pressure, and the piston is forced down. The method of bringing about these conditions in an efficient and rapid manner, and at the proper time, and of controlling the same as to speed and regularity, constitutes the novel features of the engine, which are shown in the vertical section, Fig. 2.

In open communication with the cylinder, B, in which works the piston, D, is a chamber formed by the two concentrically corrugated plates, A A′, and a ring, A″, all firmly bolted together. Within this chamber is a diaphragm, E, composed of two plates, between which is a non-conducting material. Attached to the upper and lower surfaces of the diaphragm are concentric flanges, adapted to enter the inside corrugations in the plates, A A′. This diaphragm has a reciprocating movement, alternately with the working piston, by means of which the air inside is transferred back and forth between the upper and lower parts of the chamber, which is called the regenerator. Arranged around the periphery of the diaphragm, and between the plates, A A′, and within the ring, A″, are a great many strips of wire gauze, F, through which the air passes in its way back and forth within the regenerator. The upper working parts of the engine are secured to the plate or ring, N, which is bolted to lugs upon the plate, A, thus making the engine self-contained. The lower plate, A′, rests upon the upper edge of the drum, G, which in turn rests upon the base plate; these parts are firmly bolted together.

Within this case is the furnace, which is a drum

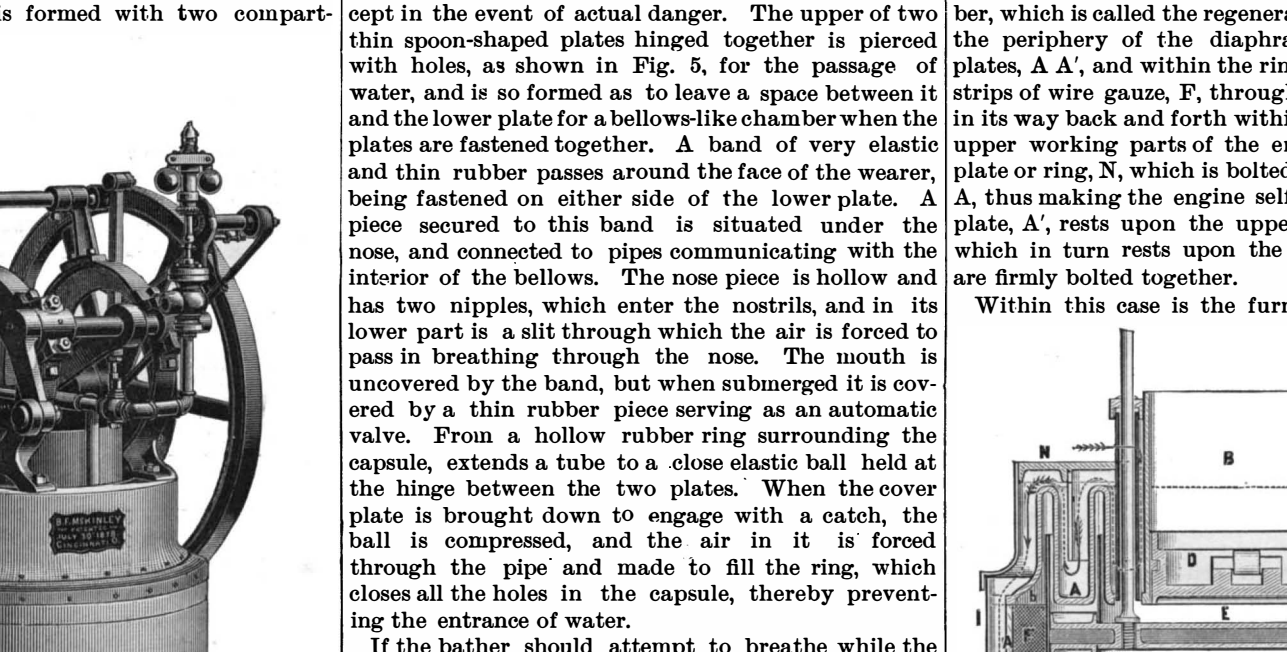


Fig. 1.—THE McKINLEY AIR ENGINE.

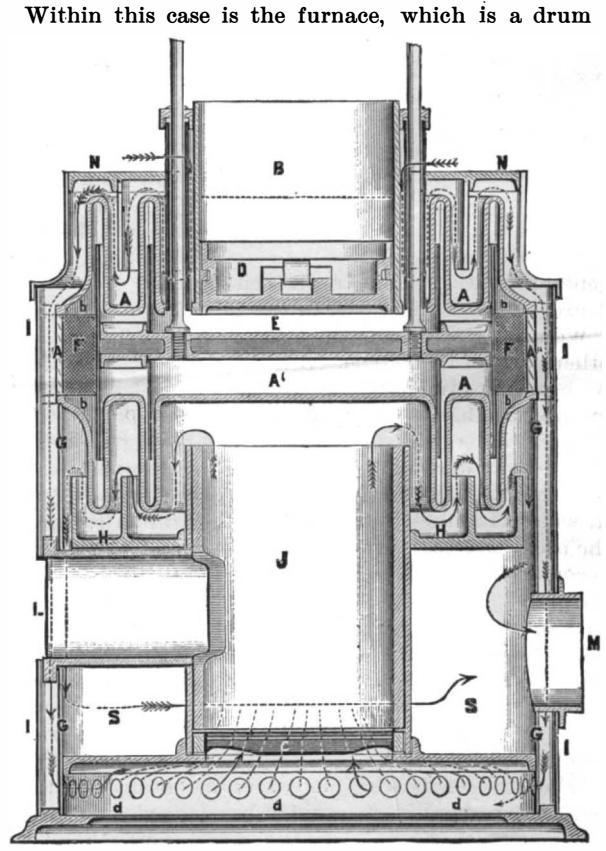


Fig. 2.—McKINLEY AIR ENGINE—VERTICAL SECTION.

lined with fire brick, J, having the grate, C, and a deflecting plate formed with flanges, H, that guide the products of combustion in close contact with the plate, A′, into the annular flue, S, whence they escape into the chimney through the opening, M. The lower edge

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of the drum has holes, *d*, through which air enters the ash pan below the grate.

An outer case, I, forms an annular space entirely surrounding the regenerator and drum. The upper part of the case conforms in shape to the plate, A, and closes up with the outer edge of the base, N, which carries concentric flanges that descend into the outside corrugations of the plate, A. These flanges and the outside case form a continuous air space, by which a current of air entering near the top of the cylinder is made to flow over the surface of the cylinder, the upper surface of the regenerator, the outside surface of the furnace case, G, and enter the ash pan through holes, *d*, to feed the fire as before mentioned. This is an entirely original feature, and has a series of remarkable functions to perform. The first effect of this current of cold air is to come in contact with the cylinder, keeping it cool; from this it passes to the somewhat warmer plate, A, keeping its temperature down also. After this it passes over the furnace casing, still warmer from the escaping furnace gases, and keeps its temperature down also, and finally enters the ash pan laden with heat, thus stimulating the fire by heat thrown off from the cooler parts of the engine. This constitutes a regenerating feature that can be carried to an indefinite degree of refinement.

We will now explain the duties performed by the other parts of the engine. A fire being built, the plate, A′, becomes quite hot in the center, the heat being less intense toward its outer edge. The lower part of the diaphragm also becomes heated, as do the lower layers of wire cloth and the upper layers to a less extent. If now the diaphragm be caused to move up, the air above it, which is cool, will be made to pass over the inside of the upper plate, A, and down through the wire cloth, becoming heated more and more as it passes through the more highly heated layers; thence over the outer part of the plate, A′, which is still hotter, and over its inside surface, gradually increasing in temperature until the greater part of the air reaches the center of the plate next to the fire. By these means the air is gradually but rapidly heated, causing the pressure to rise and force up the piston.

When the stroke is completed, as the crank turns the center, the diaphragm is made to descend, and the heated air is made to pass back again, coming in contact with the surfaces, and, being hotter, it gives off heat to them. As its temperature is reduced, it comes in contact with still cooler surfaces, and is thus gradually but rapidly cooled, until the pressure falls below the atmospheric pressure, by which the working piston will be driven down again.

These successive movements of working piston and diaphragm are produced by attaching each to a crank movement that is at right angles or nearly so with the other, so that while one is passing the center and moving slowly, the other is moving rapidly, and *vice versa*. As these operations are repeated upon the same body of contained air in the engine, and no air is supposed to escape or be introduced, there is no necessity for induction or eduction valves, and the only valve used is a small one operated by the governor, that keeps the speed uniform, by allowing a small quantity of air to pass in order to keep the engine down to a given rate of speed. It will be seen that, as the air passes back and forth in the regenerator, it gives up heat to the surface and in turn receives it back from the surface again.

It is a somewhat singular peculiarity that the change of the direction of the movement of the diaphragm changes at the same time the functions of the entire engine surface (except a very small portion of the extremes of the hot and cold parts) from heating to cooling, and *vice versa*; that is, when the movement is such as to cause the air to be cooled, then almost the entire surface of both plates, diaphragm, and all the regenerating surface becomes cooling in its effect; that is, the air brought into contact with any given surface is hotter than the surface it is in contact with, and is cooled by the contact, and a reversal of the motion brings about an exactly contrary state; that is, the air in every part of the engine is cooler than the surface in contact, and is consequently heated by the contact. The whole action is regenerative, and the only heat not converted into power is what escapes up the chimney and what radiates from the engine, which by proper means may be reduced to a minimum exceedingly small; but, owing to the surrounding current of cool air, the engine throws off but little heat.

The concentrically corrugated plates can be constructed in this form of any desired size, without danger of buckling or breaking from unequal expansion by the heat, as they can expand radially and the curves of the corrugations will stop the expansion at each turn, while, on the other hand, the plate is greatly strengthened laterally.

There is no regulation of water level or pressure to look after, and no possible danger of accident to the attendant.

The engine is entirely self-contained, and needs nothing but a stove pipe connection to a flue to make it ready for fire and work. The cost of running is that of 40 pounds of soft coal per day for a one horse engine.

The manufacturers of this engine—the McKinley Engine Co., of 17 Broadway, Cincinnati, O.—claim that its strong points are safety, cheap first cost, cheap running expense, no increased insurance rates, and ready adaptability to any kind of work.

THE LEMURS IN THE BERLIN ZOOLOGICAL GARDEN.

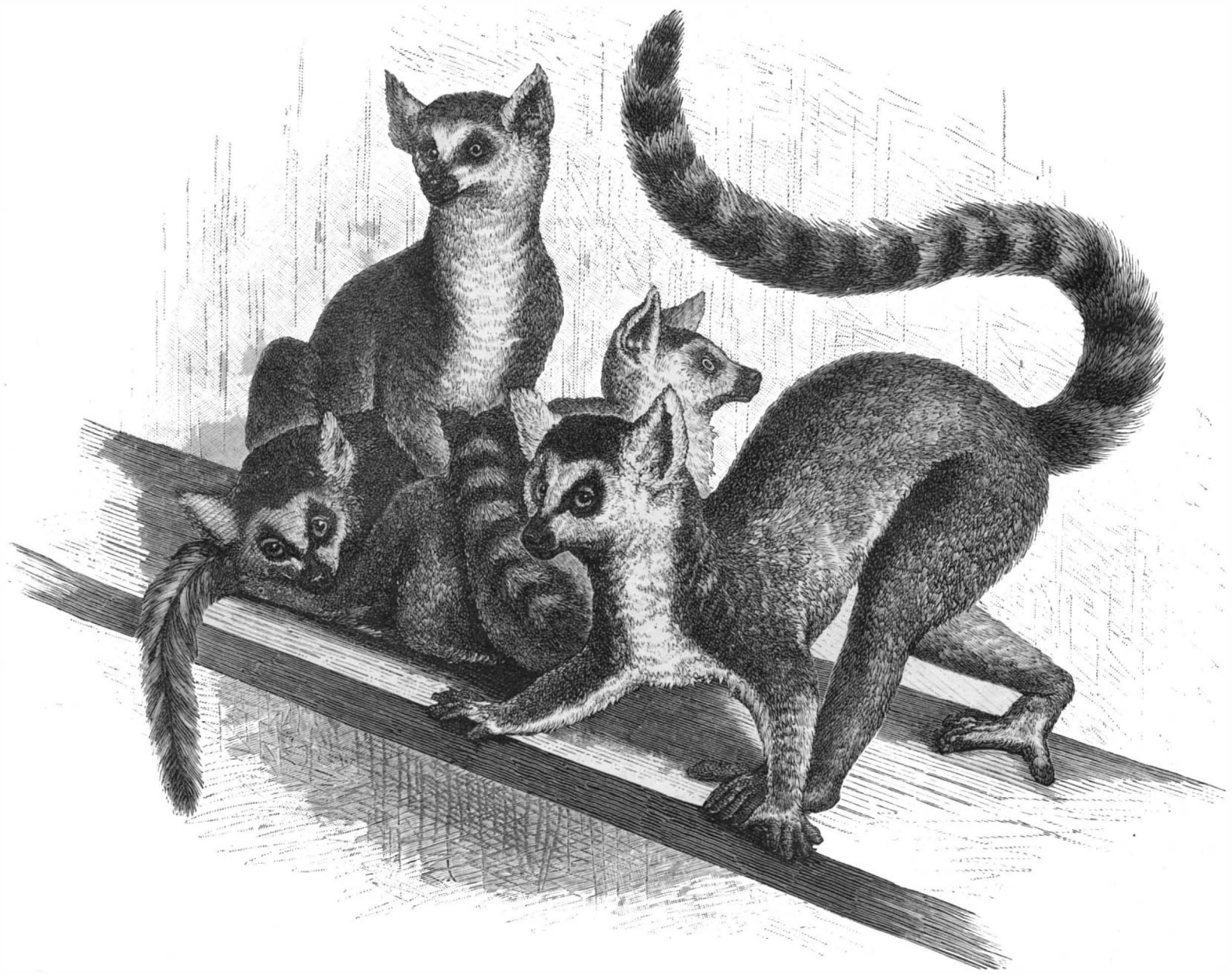
The Romans used to call the souls of the departed "Lemures," but they respected the good ones as household gods, or "Lares," while they feared the bad ones as restless, malicious ghosts and hobgoblins that wandered about in the night.

Science designates the lemur as the first family of half-monkeys, or that group of animals that can be considered as a connecting link between quadrumanous animals and gnawers.

The lemurs represented in this drawing from life are supple and bright creatures, and in their manners they remind one somewhat of monkeys, martens, and squirrels, but in certain positions they are very much like a kangaroo. The similarity is based upon the strongly developed extremities of the hind legs, which measure much more in size than the fore legs.

The *Lemur catta* has a length of from 85 to 90 cm., of which 35 to 40 is the body, and the rest is the tail.

The color of the fine wooly fur on the back is a gray-



THE LEMURS IN THE BERLIN ZOOLOGICAL GARDEN.

ish brown, with a tinge of red here and there, while the face, ears, and front part of neck are almost white; the only coal black coloring is seen around the eyes, on the nose, and on the forehead.

The black and white curved tail is quite graceful in its shape, and it is by no means a useless appendage, for in springing and jumping it serves as a rudder and balancing pole, while it serves as a stool in sitting.

When the animals huddle together at night, they twist their tails around each other, forming a sort of net about those who are sleeping.

The hands are nicely formed; the inside is deep black, while the outside corresponds to the color of the body; the fingers are exceedingly dexterous, for they pick up the smallest insect or piece of straw with great ease; they turn fruit over on all sides with the greatest rapidity, and eat it gracefully, always dropping out the unsavory portions.

Sociableness is a life necessity of our lemurs. Left alone, they become cross and soon die, while company makes different creatures of them. Then they are always merry, and chase each other around in the cage, springing among each other like monkeys, with their roguish tricks.

Most of the varieties of lemurs live in the woods of Madagascar that are the fullest of insects and fruits; they are also seen on neighboring islands, and go around nights after prey, screeching like our house cats when they mew very loud.

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Modifying the Climate by Closing the Straits of Belle Isle.

A suggestion was made by me, and published in the SCIENTIFIC AMERICAN of October 31, 1885, that the climate of the North American coast could be modified by shutting off a great portion of the "cold wall"—that southerly current which now washes our shores, and flows between us and the warm currents of the Atlantic, and reduces the normal temperature of our coast.

In this article we intend to refer briefly to some of the objections that have been raised against this plan.

It is conclusively shown by our charts that the great body of the cold wall comes down to us through the Straits of Belle Isle. Newfoundland deflects the remainder of the Arctic current to the southeast. Here, pressing against the Gulf Stream, it veers it southward in the form of a loop, and, finally, running under it, goes on toward the equator.

The Gulf Stream flows through the Straits of Florida; the main body—the portion that passes our shores—has a course directly north and a little west, is deflected slightly to the east by the coast of South Carolina, then North Carolina; it thence turns more to the north again, when it is deflected by the cold current returning from the pole. When this cold current is of least strength, as in August and September, the Gulf Stream comes within 10 miles of Barnegat; at other times it is distant 120 miles, changing with the amount of this cold current and the wind.

The location of this Gulf Stream in the Atlantic Ocean varies by 300 miles.

One branch of the Stream passes to the east, and, circling the Saragessa Sea, forms the great equatorial current.

It has been stated the Gulf Stream cannot be changed, because the difference in the specific gravity of the polar and tropical oceans causes this mighty flow of water.

In changing this current we take it as we find it, and have little to do with its first cause; but as the specific gravity theory is used against us, let us consider whether it is true. Lieut. Maury advanced that theory in his very interesting "Physical Geography of the Sea." Later, he stated that the sea was held in exact equilibrium by this same specific gravity, and still later that it was the great retarding force that prevented the currents from flowing with "milltail velocity toward the pole, covering the intervening sea with a mantle of warmth as a garment." His disciples should have followed him to the end.

Let us consider this question of specific gravity.

The water is much more salt, and consequently heavier, at the equator than at the pole. Provided both were at the same temperature, the water at the equator, being the heavier, would sink to the bottom of the ocean, and the fresher water of the northern sea would then flow down over its surface. The water would then obtain an equilibrium, and remain without current. In arriving at this condition of things, it is evident that the surface current would go toward the equator, and the under or salt current would go toward the pole. The under (salt) current becoming freshened by melting snow and ice would rise, and we have the surface current going south and the under current north.

But we have another element to consider, viz., heat. The waters about the equator are heated to a temperature of about 84° Fah. This is the equatorial surface current.

Now, we know that salt water when heated expands, has less weight per cubic foot than fresh water has when cold, and that the fresh water, which would have a tendency to flow on the surface toward the equator, by the sinking of the salt water in that region from its greater weight, by the action of heat is prevented from doing so by the expansion of the salt water at the equator. This would cause equatorial waters to flow toward the pole, if any motion was caused at all, and these two forces oppose each other.

Comparing the soundings as given by Captain Nares with the tables of the expansion of sea water under different temperatures as experimentally determined by Professor Munch, and as given by Professor Croll, of Edinburgh, in "Climate and Time," the amount of expansion from heat, we have only 4 feet 6 inches as "the height to which the level of the water at the equator ought to stand above that of the poles, in order that the ocean may be in static equilibrium."

The distance from the equator to the poles is 90°—say 5,400 geographical miles, or 6,200 statute miles. Experiments of M. Bubuat show that where the fall is less than one in one million, no motion in water can occur. This would require a height of 32 feet at the equator before the slightest motion in the form of a current could take place. But the facts are, as given by the Challenger expedition, that at the equator the water is 3½ feet lower than it is at 38° north latitude.

If this be true, can gravitation drive the water from the equator to the North Atlantic?

Sir John Herschel limits the gravitation theory to the possibility of a trifling surface drift.

Maury says: "Some currents of the sea actually run up hill, while others run on a level. The Gulf Stream is of the first class." He also says that "the greater density of the waters of the Gulf of Mexico over those of the Polar Sea is the cause of the Gulf Stream," and that "the difference in temperature between the tropical and polar regions assists as a cause."

As this difference in temperature tends to make the tropical waters lighter, it practically annuls the effect of the difference in saltness; it must retard, not assist.

As we go toward the equator, the water becomes warmer, and at the same time salter and heavier; the increasing temperature compensating for the increasing specific gravity.

The theory also maintained, that the diurnal motion of the earth is the cause of the Gulf Stream and the cold Labrador current, as stated by Maury, is as theoretical as his statement that water runs up hill or that railroad trains are in the habit of selecting particular points of the compass when they run off the track.

If the Gulf Stream is caused by gravity, or weight, it must be running down hill; and the higher center, "roof shape," as Maury describes it, indicates that the mass is impelled by a *vis a tergo*.

Water forced into an estuary or through a narrow channel is higher in the middle than on the sides, but on the falling tide its surface is concave; the same is true of a rising or falling river, or of the mercury in a barometer.

That the Gulf Stream itself, and particularly its southern branch, which joins and returns as a portion of the great equatorial current, force their way squarely against the effect of this diurnal motion is well known. We have abundant record that the climates of the earth and the currents of the ocean have seen many changes since the creation of the world; and that the changes have been largely due to changes in the great ocean currents seems evident.

One other point about which doubt is expressed is that of the heating power of the Gulf Stream.

The estimate of the volume of the Gulf Stream as given by Maury is that it is 32 miles wide, 1,200 feet deep, going at the rate of 5 knots an hour, or 6,165,700,000,000 cubic feet per hour.

Sir John Herschel's estimate was 30 miles wide, 2,200 feet deep, going 4 miles an hour, or 7,359,900,000,000 feet per hour; Dr. Golding's, 5,760,000,000,000 feet per hour.

Prof. Croll took the stream as 50 miles broad, 1,000 feet deep, and 4 miles per hour. In order to bring his estimate beyond any possible objection, he reduced it one-half. He assumed the entire mass of the Stream started at a temperature of 65° and returned at 40°, making the loss of heat 25°; and this he claims to be an underestimate.

Each cubic foot of water, in this case, carries for distribution 1,158,000 foot pounds of heat.

According to the above estimate, 2,787,840,000,000 cubic feet of water are conveyed from the Gulf Stream per hour, or 66,908,160,000,000 cubic feet daily.

The total quantity of heat thus transferred per day is 77,479,650,000,000,000,000 foot pounds.

This amount of heat equals all that falls upon the earth within 32 miles of each side of the equator—a belt 64 miles wide around the earth.

Comparing the quantity of heat conveyed by the Gulf Stream with that conveyed by the atmosphere, the density of air to that of water is as 1 to 770; the specific heat to that of water is as 1 to 4·2. The amount of heat that will raise one cubic foot of water one degree will raise 770 cubic feet of air 4·2° or 3,234 cubic feet 1°. The Gulf Stream, therefore, is the equivalent of a constant current of air at a temperature of 65°, over 600 feet deep, blowing from every part of the equator at the rate of over 20 miles an hour.

We have another element in the heat abstracted by our littoral current, known as the "cold wall."

Taking the mass of this cold wall to be 10 miles in width by 150 feet in depth, running at 2 knots an hour, for 24 hours, will give us 2,280,960,000,000 cubic feet per day.

Supposing the water in passing from the Straits of Bell Isle to Cape Hatteras is raised 20°, the amount of heat absorbed by it would be 7,376,624,640,000,000 cubic feet of air lowered 20°—equivalent to a belt 1,000 miles long, 50 miles wide, and a mile high raised 20° above the freezing point every 24 hours.

One other statement made was that a change in the location of the Gulf Stream would not affect our climate, because our cold weather comes from the west and northwest.

I grant that sometimes that will occur. The same cause that chilled Bermuda and made South Florida a frozen region during the winter of 1885–86 would at certain seasons bring us cold weather; but it is known, and fully stated by Lieut. Maury, that, during the intense cold on our coasts, ship masters should make their course directly east for the Gulf Stream; that across this the ordinary cold winds do not blow, and for the reason that the atmospheric pressure is higher on that portion of the Atlantic.

If we had not the cold wall between our shores and the Gulf Stream, it is fair to presume that we should have a less stormy coast, as the juxtaposition of these two currents with their difference in temperature must from that circumstance tend to an unstable condition of atmospheric equilibrium. Our cold northwest winds would then sweep to the north of us, and become westerly and southwesterly winds.

Air and water go to the points of the least resistance. An examination of the winds of the globe, now so fully described by Coffin and others, indicates that the great currents of the ocean, without which the earth would not be habitable, are caused by atmospheric currents; and that these currents are deflected and diverted by the coast lines is plainly shown by every coast line on the earth.

With the cold wall cut off, we would have along our sea coast the year round the fine fish that now come straggling up to us late in the season, which would be ample compensation for the codfish which would then be found, as now, on the Newfoundland Banks; and we should lose the occasional visits of whales that now follow the cold stream, and, hemmed in by our shores and the warm waters of the Gulf, become a prey to our Long Island fishermen.

The Straits of Belle Isle may never be closed. It is England's territory, and she will not pay the cost for the benefit of her Canadian provinces and the United States. But I advance the theory that our climate can be modified by closing the Straits of Belle Isle as a problem in physical geography capable of an engineering solution.

JOHN C. GOODRIDGE, JR.

The Audubon Society for the Protection of Birds.

"The moment a bird was dead, however beautiful it had been when in life, the pleasure arising from the possession of it became blunted." So wrote the great student of birds, John James Audubon, and such is the adopted motto of the society for their protection, which bears his name. In answer to the appeal of the American Onithologists' Union for the protection of our native birds, not used for food, from destruction for mercantile purposes, the Audubon Society was founded in New York city in February last.

We have already called attention to the indiscriminate slaughter of the innocents—"the very St. Bartholomew of birds"—which is the result of the present unfortunate fashion of using the stifled singers for personal decoration, but to make the appeal still stronger, we are tempted to repeat some of the statistics collected by the society. A single taxidermist in this city handles annually 30,000 bird skins; a single collector brought back 11,000 skins as the result of a three months' trip; one small district on Long Island furnished about 70,000 birds to the metropolis in four months' time. These figures amount in the aggregate to very large totals. One New York firm had on hand 200,000 birds on the first of February.

But large as this destruction is, it is not limited by domestic consumption. Many birds are sent to the foreign markets. In London there were sold from one auction room, and in a space of only three months, 404,464 West Indian and Brazilian birds and 356,389 East Indian birds. In Paris 100,000 African birds have been sold by one dealer in a year. The depletion of our own fields and woodlands has been quite as large in proportion to their riches. A New York firm had recently a contract for supplying 40,000 American birds to one Paris firm.

The protection of these little visitors is not a matter of sentiment alone, though if it were we should still urge it, for the sentiment is one which it is highly creditable for every one to entertain, but it has also a utilitarian aspect. The interests of agriculture are also involved. The food of the smaller birds consists largely of the insects destructive to growing crops. If nature's militia, the army of birds, be killed, it will be impossible to find a substitute for their faithful guardianship.

The Audubon Society invites co-operation in carrying out its purpose all over the country, and will furnish copies of the Audubon pledge and other printed matter on application. Its address is 40 Park Row, New York. Membership is open to any one who will sign the printed pledge, but it involves no other responsibility. There are no dues or expenses of any kind. We are glad to see that the most influential women's club in New York—Sorosis—has become interested in the work of the society, and is largely represented in its membership.

Birds Killed by Electric Light.

The latest strike in Chicago is that of the birds. When the watchman of the Board of Trade building made his rounds some days ago, he found the sidewalks and streets in front of the tower covered with numbers of dead birds of all sorts. They had evidently been killed by striking the electric lights at the top of the tower, for the roof of the building was found to contain numbers of them, and each of the lamps in the big circle of light had its full share, one globe containing eight. It is reported the birds were of many varieties, some of them being unfamiliar to the local ornithologists. The theory advanced is that the birds belonged to flocks migrating northward, and being attracted by the great light, were killed the moment they came in contact with it.

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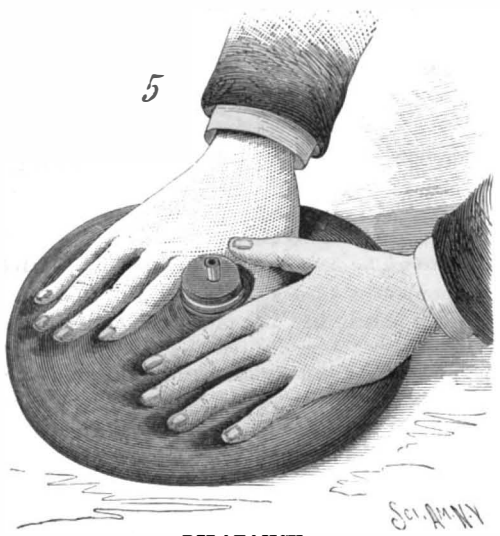
DILATANCY.*

T. O'CONOR SLOANE, PH.D.

Comparatively few papers read at meetings of the British Association for the Advancement of Science receive the compliment of a request for a second reading. Such action was taken upon Prof. Osborne Reynolds' paper "On the Dilatancy of Media composed of Rigid Particles in Contact," by the Association at its Aberdeen meeting, last September. The author illustrated by experiments, brilliant from their very simplicity, some of the theoretical properties of an ether that would act as a producer of electric and gravity strains. Such illustrations must be received cautiously. It will not do to accept an experiment with solid matter as proof that a hitherto theoretical ether has an existence or is in any sense composed of incompressible volumes. But when it is remembered that many of the best minds have come to the conclusion that the causes of gravitation and electricity will never be discovered, anything



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that hints at an explanation is most welcome. It is for this reason that Prof. Reynolds was so well received by his associate members. On Sept. 10, 1885, he read his paper before Section A; and by request, on Sept. 15, he read it again before Section B of the Association. The original paper, giving the mathematics of the subject, and pointing out its possible explanations of some of Clerk Maxwell's theories, is given in the *Philosophical Magazine* for December, 1885. This paper may be confidently recommended to our readers.

But apart from the theoretical bearing of the newly discovered law, its experimental illustrations are so simple and striking that they will interest all. In the cuts are shown some of the experiments that may be performed with such simple apparatus as an India rubber bag and a glass tube.

In Fig. 1 is shown an illustration of two orders in which solid particles may be arranged, the close order and the loose order. The dotted lines in the loose order show the size of the including cube. It will be seen that the particles in loose order occupy much the larger volume. The phenomena of dilatancy depend on the power of rigid particles of any shape to arrange themselves in loose or close order.

Let an India rubber bag, such as is used for toy balloons (one which has been inflated, and thereby stretched well, is the best) be filled with dry sand. The thinner and more elastic the bag, the better. Then by a perforated cork secured tightly in its neck a bent glass tube is connected, opening into its interior, as in Fig. 2. The bag is first shaken in the palm of the hand, so as to bring about a close order of the sand. The end of the tube is dipped into water. Now, the question may be asked, What will happen if the bag is squeezed? The most natural answer is that air will be driven out; but on compressing the bag no such action takes place. As the bag is squeezed, water rises up into the tube and by properly proportioning the relative sizes, the fluid may be drawn over the bend of the tube and into the bag. Extraordinary as the result seems, it is easily explained. The sand originally was in the close order, by squeezing it was brought into the loose order, the open spaces between the particles were dilated, and water rose under the influence of the partial vacuum.

A larger bag, such as is sold in the India rubber stores for use as an invalid's ice bag, is better. These are made of thin white India rubber, of good quality and highly elastic. The neck may be closed with an India rubber cork, secured by very tight winding with string or by a strong rubber band. Such a bag, containing sand and then filled with water, is represented in Fig. 3. The sand must first be put in until the bag seems about full, then water must be poured in until the air is entirely displaced. A bent tube, as before, is inserted in the cork, and the end dipped in a vessel of mercury. The bag is now strongly squeezed (Fig. 4). Any excess of water that was collected above the sand disappears. The India rubber around the cork becomes shrunk and wrinkled under the tension, and the mercury begins to rise, until, if all is properly conducted, a full, or nearly full, vacuum is shown. To produce a full vacuum, absolutely no air must be contained in the bag; the space not filled with sand and the tube around its bend and above the mercury must be full of water. The sand has been disturbed, and brought out of a condition of close into one of loose order. When the bag is pressed and the excess of water disappears, it becomes comparatively rigid. It seems quite unamenable to pressure.

But if the pressure be accompanied by shaking, then the sand is kept in its close order, and any shape can be given to the bag. This operation is shown in Fig. 5. The bag can be rolled into an irregular cylinder, or can be kneaded into a disk without trouble, provided it is shaken continually. When made into a disk, if it is placed on its edge and subjected to pressure, it will yield a little, but ultimately take its final shape, as in Fig. 6, when the entire weight of the experimenter can be supported by it. In this way hard rigid blocks, such as shown in the same cut by the side of the observer, are produced. When one of these blocks is placed cork uppermost, or in the position it occupied while being shaken, and the least agitation applied, it settles down instantly into the soft mass of sand and water that it was originally. For these experiments the perforation in the cork must be closed.

In all these cases, the force that is brought into action is the atmospheric pressure. By changing the order of the grains the tendency is to an enlargement of volume, which would produce a vacuum. Hence the conservation of the shape by the weight of the atmosphere appears.

The resistance offered by a cloth or canvas bag of sand to change of shape, utilized in supporting bridge centers, and the sudden drying of wet sand around the foot upon the sea shore, receive a ready explanation in this law. As a rule, all manner of rigid particles inclosed in or by a movable boundary display it in some degree. It even has its bearing on the angle of repose of different sands.

The experiments can be performed with shot or marbles or any small particles, as well as sand, but on account of its lightness and fineness the latter is generally preferable. We have only given a few of the experiments. Our readers will see that there is room for many others. Small bags of sand and water can be shaped into disks and rolled the length of the room. Large marbles ¾ of an inch in diameter can be substituted for sand. The great point and difficulty is to prevent air leaking into the bag. It interferes, in degree only, with the success of the work.

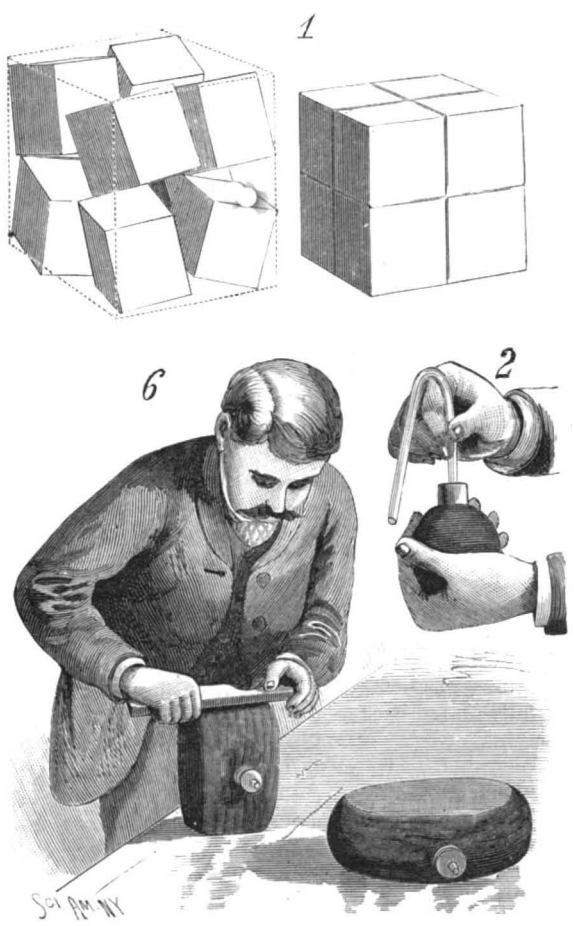
* See SCIENTIFIC AMERICAN, April 10, 1886, for a review of a recent lecture on this subject by Prof. Osborne Reynolds.

Manufacture of Mineral Colors in the United States.

The following particulars, taken from the "Report of the United States Geological Survey on the Mineral Resources of the States," have been furnished to the *Chemical News* by the author, Dr. Marcus Benjamin.

There are in the States 31 white lead works, in all of which the so-called Dutch method is followed, the material used being pig lead. The total produce during the year 1884 was about 65,000 tons.

A "sublimed lead" is made in Missouri by the direct oxidation of galena in a reverberatory furnace.

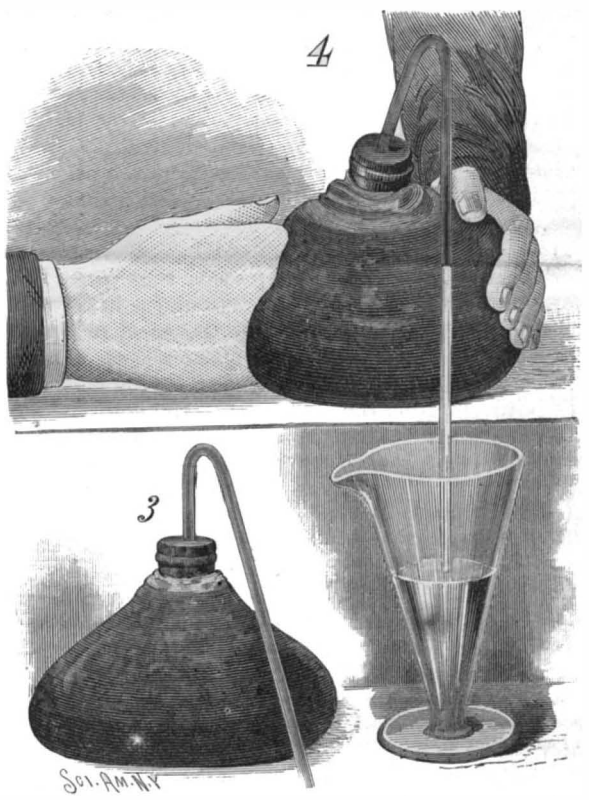


EXPERIMENTS IN DILATANCY.

Zinc white was manufactured in the same year to the extent of 12,000 to 15,000 tons. It is used not only as a color, but in the manufacture of India rubber, in pottery, and in the paper trade.

Barium sulphate (heavy spar) was raised to between 25,000 and 30,000 tons. Barium compounds are used as paints under the names of blanc fixe, satin white, etc., and in the form of peroxide for bleaching purposes. Barium sulphate, both the natural and the precipitated, is largely used as an adulterant.

Terra alba (ground gypsum) is imported from Nova



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Scotia, while a superior quality is brought from France. In addition to its legitimate use in making white pigments of a low grade, it serves for adulterating a variety of commercial articles.

The quantity of red lead produced in the United States could not be ascertained, but the imports at New York amounted to 198,588 pounds.

The American production of litharge is also an unknown quantity. The imports were only 54,183 pounds.

Concerning ochers, it is said that with the possible exception of the deposits recently opened up near St. Louis, the American production is inferior to the imported qualities. "American ochers for the most part lack strength or tinting properties, and require too much oil for grinding." The annual consumption in the United States is estimated at 10,000 tons, of which about 3,000 tons are imported.

American umbers are inferior to those imported from Italy and Turkey. Sienas are found to a small extent in Virginia and Pennsylvania, but most of that used is imported from Italy.

There is no mention of lapis lazuli having been found in the United States, but there are two American manufactories of artificial ultramarine, with a yearly output of 1,400 tons.

Ground slate is used as a pigment to the extent of 2,000 tons yearly, and occurs in four colors—green, red, slate, and drab

An Improved Developer.

Dr. A. A. Mantell, in the *British Journal of Photography*, recommends the following formula:

1.

Pyro	1 drachm.
Citric acid	5 grains.
Sulphite of soda	1 drachm.
Water	10 ounces.

2.

Carbonate of potash	1 ounce.
Water	20 ounces.

3.

Bromide of ammonium	2 scruples.
Liquor ammoniæ fort.	1 drachm.
Rain water	20 ounces.

For development, mix equal parts of 1, 2, and 3; in cold weather a little more of 3 may be used.

The advantages obtained by its use are: 1st. Greater rapidity in development than when soda and potash are used alone or in combination. 2d. Comparative freedom from the yellow tinge caused by soda. 3d. Greater density than can be obtained by ammonia alone. 4th. Greater detail than can be got by soda alone.

MR. THERON E. PLATT, of Fairfield county, Conn., has raised two hundred varieties of potatoes on his farm during the past year. The study of fungoid pests of the potato has also occupied his attention, and his discoveries respecting certain diseases of this plant are likely to prove serviceable.

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ENGINEERING INVENTIONS.

A railroad signal has been patented by Mr. Hobert B. Potter, of North Adams, Mass. It consists of a shaft mounted to turn on a post, a signal wing on one end of the shaft and an arm on the other end, with a curved arm pivoted on the post and connected by a link with the arm on the end of the shaft, so when the signal is lowered its position is not further affected by pulling the wire for swinging it down.

A pumping and drilling machine has been patented by Mr. Abraham W. Carnahan, of Rouseville, Pa. The tower is of the usual construction, and the pump or drill rod is operated by crank levers and rocking bars connected directly with the crank shaft of the engine in such manner as to make a simple and inexpensive construction, and one not apt to get out of order.

AGRICULTURAL INVENTIONS.

A hay carrier has been patented by Mr. Thomas S. Davidson, of Colesburg, Iowa. It consists of a carriage formed of plates pivoted to small wheels adapted to roll along the ridge pole when the invention is used for depositing hay in a mow or on a stack, with other novel features, being simple in construction and convenient in use.

MISCELLANEOUS INVENTIONS.

A hose coupling and hydrant attachment has been patented by Mr. John Young, of Tiffin, O. This invention covers novel forms and arrangement of parts in that class of hose and pipe couplings where the meeting sections are clamped together by a hook on one section engaging pins or studs on the other.

A bottle stopper has been patented by Mr. James M. Kerr, of New York city. The stopper is composed of a tube, a cork placed upon it, a cap; and a ball valve placed in the cap, so that the stopper automatically closes airtight, but permits the escape of liquid as desired, by inverting or slanting the bottle.

A sash fastener has been patented by Mr. Alanson Cary, of New York city. It has a pendent pivoted locking bar, with which is combined a finger lever for operating the bar, a frame piece for receiving these devices, and a fixed plate to engage with the finger lever, the device being mainly designed for windows having upper and lower sashes.

A rein holder has been patented by Annah E. Bussell, of Nashua, N. H. This invention covers a novel construction of a rein rest or holder to be attached to the dashboard of vehicles, over or through which the reins may be passed to prevent their slipping down on the back of the horse and becoming troublesome.

A process of purifying potable and other waters has been patented by Mr. Farnham M. Lyte, of Cotford, Surrey Co., Eng. It consists in the production in the liquid of aluminum hydroxide from sodium or other aluminate and an acid aluminum salt, any remaining excess of hardness to be neutralized by an additional quantity of aluminate.

A gate has been patented by Mr. Thos. W. Edrington, of Patriot, Ind. It is made to slide by a supporting rail in a deeply grooved roller on a heavy post; and through ropes and pulleys on this post and on vertical posts at the ends of the gate, it may be readily opened by parties desiring to pass without the necessity of their descending from a vehicle.

An alarm attachment for measuring vessels has been patented by Mr. Albert Daggett, of Strong, Me. Combined with a gong hammer and the mechanism for operating it is an inverted U-shaped lever, so connected to a float that the attachment will automatically give an alarm when the vessel on which it is fixed is filled or almost filled.

A stay roller for sliding doors has been patented by Mr. Frank P. Coleman, of Brockport, N.Y. It is so made as to hold the outer edge of the door closely against the side of the barn or other building to which the door is hung, the roller being yieldingly mounted, so as to give when encountering irregularities from warping of the material, snow and ice, etc.

A flooring clamp has been patented by Mr. Loren G. Welch, of Groton, Vt. It is so made that the teeth of the base engage the floor joists in such position that when the lever is raised its head bears against the plank, which are clamped up when the long arm of the lever is depressed, the rounded head not damaging the edge of the board, and no interposed jam being necessary.

An evaporating apparatus for saccharine and other juices has been patented by Mr. Jose Guardiola, of Chocola, Guatemala. It consists of a series of tanks with raised ends, between which are steam coils, curved pipes below connecting the tanks, with other novel features, whereby the evaporator will act rapidly because the juice is divided into several portions.

A pivotal support for mirrors, transoms, etc., has been patented by Mr. Oscar P. Breithut, of Williamsport, Pa. It consists of a hinge formed of three parts, a conical pintle, a socket adapted to receive it, and a support for the projecting end of the pintle, the conical pintle being held in frictional contact with its socket, the device being readily applied for tilting mirrors, transom lights, etc.

A liquid bedded keel block has been patented by Mr. Frederick C. Lang, of Jersey City, N. J. It consists of cases, with stuffing boxes, followers, connecting pipes, valves, and outlet pipes, whereby, using these blocks, all parts of the keel will be equally supported, and any part thereof can be exposed, repaired, and again supported, the blocks adjusting themselves to any inequalities of the vessel's keel.

A dry paint composition and a mixed paint form the subject of two patents issued to Mr. Geo. W. L. Marsden, of Wilmington, Del. Among the ingredients used are mineral wool or other mineral fiber, pulverized red or white lead, hydraulic cement, and pulverized resin, with turpentine, linseed oil, and varnish, to make paints impervious to the action of the atmosphere, or to air and water.

A stock or hay frame has been patented by Mr. John T. Carrington, of Clay Center, Kansas. It is designed for use in connection with or as a substitute for a wagon box, facilitating the loading and carrying of animals therein, making a cage-like box for the transportation of calves, sheep, hogs, etc., or the device can be used on railroads or in private stock yard chutes.

A mould for making artificial stone, tiles, etc., has been patented by Mr. Edward Ormerod, of Brooklyn, N. Y. It may be made of wood or metal, and is formed of four bars hinged together, one end bar having a notched bar projecting beyond the end, and outside bar having a pivoted latch, whereby concrete may be conveniently fixed in position and compressed under a hydraulic press.

A machine for making flat paint and whitewash brushes has been patented by Mr. Samuel A. Verbryck, of Belleville, N. J. The handle, bristles, and band are put together in the ordinary manner, and so inserted between clamping levers that the bristles will be firmly compressed, the band lying smoothly to fit the reduced size of the compressed brush until it can be firmly fixed to fasten the brush upon the handle.

A combined newspaper stand and file has been patented by Mr. William E. Bailey, of Shrewsbury, Pa. It has a tubular post attached to a base plate, in connection with an adjustable frame formed of longitudinal and transverse bars, the device being calculated to hold newspapers so they can be conveniently read, while it can be conveniently adjusted and readily moved from place to place.

A window shade has been patented by Mr. Walter J. Cox, of Wichita, Kan. Combined with bracket pieces at the sides of the window and two shade rollers journaled therein are various novel features for arranging one shade at the top and another at the bottom of the window, whereby the shades can be adjusted easily, require but little space, and so no light can pass in between the shades.

A band cutter and feeder for thrashing machines has been patented by Mr. Michael Doran, of Bergen, N. Y. The feeder frame is made in two sections, hinged together on their under side, so the attachment may be conveniently folded for transportation, and there are cutters to sever the bands on the sheaves, with springs to force the carriers to their work as the bulk of the sheaf diminishes.

A sash fastener has been patented by Mr. Martin O. Lane, of Altoona, Pa. Locking blocks formed with slots are so mounted, with levers arranged to ride in the slots, that when the levers are depressed the blocks will be brought into engagement with the window sash, the device having no springs to get out of order or pins to be lost, and adapted to hold the sash in position with or without weights.

A mail crane attachment has been patented by Messrs. Oliver P. and Cassius M. C. Williams, of Connor's Station, Kan. A frame is pivoted to swing in a horizontal plane to follow the motion of the car, and a yieldingly connected catch is on and moves with the frame, whereby the bag or pouch will not be blown off by the wind, but may be readily removed, without tearing, by the attachments of mail cars.

A brick machine has been patented by Mr. Frank Hartings, of St. Rosa, Ohio. It is so designed that in forming the bricks the clay is forced and delivered to the die by a continual forward movement, whereby the clay may be compressed in a homogeneous state, to give the brick the same density throughout, and they may be made by this improvement in the ordinary brick machine.

A spinning and twisting machine has been patented by Mr. William Baird, of Almonte, Ont. Canada. This invention relates especially to a sliding plate carrying spring arms with pulleys journaled therein, carrying a tension pulley for securing the requisite degree of tension on the spindle bands according to the nature of the fibers being spun or the required fineness or coarseness of the yarns.

A case for lead pipe has been patented by Mr. Albert Kohler, of Waconia, Minn. It is preferably made in octagonal form, with one or more partitions, a covering and bottom of transverse strips crossing the frame at different angles, curved strips secured to the transverse strips of the partition to separate the adjacent convolutions of the pipe, to prevent injury by the jamming of one layer or coil upon another.

A roller for photographic sensitive paper has been patented by Mr. Erastus B. Barker, of New York city. This invention provides hollow rollers or cylinders on which photograph paper is wound or stored, the cylinders being made to fit and readily slide upon the camera rollers, thus obviating the inconvenience of winding the paper upon the photo roller itself, a tedious operation as hitherto performed in the dark room.

A swinging centerboard for vessels has been patented by Mr. James A. Deering, of Gloucester, Mass. It is preferably made of metal and several tons in weight, and attached to the lower ends of rods by hinges, so that when lowered it will be free to maintain a vertical position in the water, no matter to what extent the vessel may keel over, the invention covering mainly the peculiarities of the device for raising and lowering.

A carriage top former has been patented by Mr. James F. Kirkland, of Guelph, Ont., Canada. It consists of a base or body pivotally mounted on a stand and having adjustable end and side clamps, whereby carriage tops may be mounted in proper position at the time they are being trimmed, providing a form which may be quickly and accurately adjusted to hold the several parts of frames of varying form and size in their required relative position.

NEW BOOKS AND PUBLICATIONS.

BRAND BOOK OF BRITISH IRON AND STEEL AND TIN MANUFACTURERS. Compiled by Herbert W. Griffiths. London: The *Iron Trade Exchange*.

This is a directory of the manufacturers that gives the extent of their plant and kinds of goods they severally make, with the trade brands therefor, which cannot fail to be of especial value to all who are themselves metal workers or dealers in a large way.

MCCARTY'S ANNUAL STATISTICIAN. 1886. L. P. McCarty. San Francisco, Cal.

This book contains over 600 closely printed pages, largely of figures and dates, touching industry and politics, history and geography, things curious and things useful, arranged as though for convenience in answering odd and unusual questions, as well as many which occur in every day disputes.

ANNUAL REPORT OF THE CHIEF OF ORDNANCE, FOR THE YEAR ENDING JUNE 30, 1885. Washington: The Government, 1885.

The report of the Chief of Ordnance contains information of considerable interest, both in the accounts of special inventions examined by the department, such as Gen. Russell Thayer's dirigible balloon, and motor, and Dr. Buckner's aerial drop for explosives; and in the tabulated records of the performance of different weapons. The metallurgical experiments made in connection with the casting of ordnance have a value independent of the art of war.

ELECTRO-DEPOSITION OF GOLD, SILVER, NICKEL, COPPER, ETC. By Alexander Watt. London: Crosby, Lockwood & Co.; New York: D. Van Nostrand.

All work in the department here treated of partakes of a development so recent that each year adds something important to our knowledge of the practical details best adapted for the more perfect operation of electro-metallurgical processes, and this book brings down the records pertaining to such progress to the latest date. Deposition by immersion is also treated of, the recovery of gold and silver from waste solutions, the materials used, and the auxiliary operations connected with electro-deposition.

PRACTICAL TREATISE ON GEARING. Providence, R. I.: Brown & Sharp Manufacturing Co., 1886. (Price $2.10, post-paid.)

This is an excellent little work on one of the most important subjects which comes up in machine design—the proper form of gearing. It has been prepared for men in practical life, who would like to know how to construct correct gear wheels, but who have not the opportunity to take up the subject in the thorough technical manner in which it is presented in the ordinary text books. It has fulfilled its purpose admirably. Throughout it is always plain and practical. Any intelligent workman will have no trouble in understanding either its explanations or directions. The typography is clear and discriminating; the cuts and diagrams uniformly good. The marginal indices make it convenient for reference.

REPORT OF THE COMMISSIONER OF EDUCATION, FOR THE YEAR 1883–84. Washington: The Government, 1885.

The fourteenth annual report of the Commissioner of Education shows a gratifying increase in the amount of information collected by the office. Its usefulness to the teachers of the country is better appreciated than formerly. As a bureau of information its resources have largely increased, and have been better utilized. The volumes in the pedagogical library now number 16,500, and the pamphlets 42,100, furnishing sources of information not elsewhere available. The museum of educational appliances is also being extended. The report contains much of interest in the detailed educational methods pursued in the different States and Territories, as well as a glance at the status of education in foreign countries. Statistical tables of schools and school publications occupy a large part of the volume. A well arranged index has been added.

Light Reading for an Idle Hour.

The Bostonians (Macmillan & Co.), a novel by Mr. Henry James, presents in a rather attractive form, and with considerable literary ability, a decidedly extreme view of women's sphere and mission. If the title means that the author believes such ideas are prevalent in Boston, he certainly should be commiserated with upon an experience which has led him to such conclusions; but the subject is one on which it is always easy to elicit a deal of small talk at the country boarding house or the seaside hostelry, for which Mr. James' book will afford a graceful introduction.

A Tale of a Lonely Parish (Macmillan & Co.), by F. Marion Crawford, is perhaps rather an artificial presentation of life in a small English hamlet, with quite sufficient introduction of startling incident to hold the attention of the reader to the close, when all the principal characters of the story are left in the most comfortable condition possible.

The Salammbo of Gustave Flaubert, translated by M. French Sheldon (Saxon & Co.), is a striking story of love and war in the time of ancient Carthage. The author may be called the founder of the French naturalistic school, but this work has been exceedingly difficult to render into English, with proper expression of its life and action, although it has long had a high place in French literature.

Received.

GYRATING BODIES: AN EMPIRICAL STUDY. By C. B. Warring, Ph.D. Poughkeepsie, N. Y.

EIGHTH ANNUAL REPORT OF STATE BOARD OF HEALTH OF CONNECTICUT. Printed by order of the Legislature, by Tuttle, Morehouse & Taylor, New Haven, Conn.

THIRD ANNUAL REPORT OF BUREAU OF STATISTICS OF LABOR, STATE OF NEW YORK. Albany, N. Y.: The *Argus* Company.

PRECAUTIONS TO BE ADOPTED ON INTRODUCING THE ELECTRIC LIGHT. By Killingworth Hedges. London and New York: E. & F. N. Spon.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

3 inch *Bardou* Telescope, $52. Tydeman, Camden, N. J.

Wanted—Some experienced man or firm to handle, on royalty or commission, two recently patented articles in the hardware line. The manufacture already commenced. Address W. & H., Bloomville, Seneca County, Ohio.

$3,000 will buy the right to patent Morgan's U. S. patent Horse Hay Fork Returner in Canada. Big bonanza. Address John H. Morgan, Jr., Aurora, Ill.

Send to the *Railroad Gazette*, 73 Broadway, New York, for a catalogue of Locomotive, Track, and other railroad books.

Emery Wheels of unusually superior quality for wet grinding. The Tanite Co., Stroudsburg, Monroe Co., Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Pumps for liquids, air, and gases. New catalogue now ready.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Grimshaw.—Steam Engine Catechism.—A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*. 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 288.

Cutting-off Saw and Gaining Machine, and Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Wm. Frech, Sensitive Drill Presses, Turret and Speed Lathes combined, Power Punching Presses, 68 W. Monroe Street, Chicago.

Iron, Steel, and Copper Drop Forgings of every description. Billings & Spencer Co., Hartford, Conn.

See Burnham Automatic Engine adv. last and next week.

We are sole manufacturers of the Fibrous Asbestos Removable Pipe and Boiler Coverings. We make pure asbestos goods of all kinds. The Chalmers-Spence Co., 419 East 8th Street, New York.

Crescent Solidified Oil and Lubricators. Something new. Crescent Mfg. Co., Cleveland, O.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

60,000 *Emerson's* 1886 ☞ Book of superior saws, with Supplement, sent free to all Sawyers and Lumbermen. Address Emerson, Smith & Co., Limited, Beaver Falls, Pa., U. S. A.

Safety Elevators, steam and belt power; quick and smooth. D. Frisbie & Co., 112 Liberty St., New York.

"How to Keep Boilers Clean." Send your address for free 88 page book. Jas. C. Hotchkiss, 93 John St., N. Y.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 76.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Brass and Iron Working Machinery, Die Sinkers, and Screw Machines. Warner & Swasey, Cleveland, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Chucks—over 100 different kinds and sizes in stock. Specials made to order. Cushman Chuck Co., Hartford, Ct.

Use the Old and Reliable.

Catarrh destroys the senses of smell, taste, and hearing, rapidly becomes offensive, and often culminates in consumption and insanity. No matter what stage the disease has advanced to, Dr. Sage's Catarrh Remedy will certainly cure it. This preparation is the only sure cure for this malady in the market, yet has many imitators. Others may fail; it never does. Your druggist sells it.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) L. H. writes: A man who has had considerable to do with steam engines and boilers, as fireman and engineer, asserts that it requires more water (more pumping at least) to run an engine when the atmosphere is charged with vapor and the barometer low than at other times. He states that the experience of other engineers and firemen of his acquaintance agrees with his own in this matter. Is it probably true, if so, how explained? A. It is probably not true. The barometric variations in the density of the atmosphere may make a very slight difference in the pressure gauge reading, and also in the action of the fire. Low barometer with saturated air also affects the draught and combustion.

(2) B. M. W.—The gas which escapes from the earth in the localities of natural gas wells is supposed to have been generated by the internal heat of the earth, and confined to the porous or cavernous lower strata of rocks by a later deposit and hardening of a close grained upper strata. There is a possibility of a slight depression of the earth's surface in the oil and gas region, unless the percolation of water should in a measure counteract it. The depth at which the gas cavities are tapped is equal to a water pressure from the surface of several hundred pounds to the square inch. The thickness of the solid crust of the earth is probably from 50 to 75 miles, although there is room for a variety of hypotheses on this point.

(3) W. L. R. desires (1) a recipe for making varnish black, such as used on iron work, like sewing machines. A. Such work is japanned, not varnished. See SUPPLEMENT, No. 316, on process. 2. What kind of acid is used for testing gold, how is it used, and how will it act? A. Test with nitric acid. It will have no effect on gold, but readily dissolves most other metals usually met with.

(4) J. N. C. desires the formula for making the "walnut hair dye." A. The simplest form is the expressed juice of the bark or shell of green walnuts. To preserve the juice, a little alcohol is commonly added to it with a few bruised cloves, and the whole digested together, with occasional agitation, for a week or fortnight, when the clear portion is decanted and, if necessary, filtered. Sometimes a little common salt is added with the same intention. It should be kept in a cool place. The most convenient way of application is by means of a sponge.

(5) V. G. (Mexico).—Apparently no very complete exhaustive analyses of the poison of the scorpion have yet been made. The best on record are those by Jousset, presented to the French Academy in 1870 and published in the *Comptes Rendus* of that year. He gives no definite statement of the chemical constitution of the venom, but does state the mode of its action upon the blood, by which in severe cases it causes death. It effects the red corpuscles, paralyzing them so that they cohere one to another, thus becoming agglutinated until they are unable to pass through the capillaries, and may cause fatal obstruction. So far as known, there is no chemical antidote which can neutralize the poison, but inasmuch as, like all animal poisons, the action on the nerve force, or in other words, the vital force, is in the nature of depression, a remedy which stimulates that force temporarily is plainly indicated; alcohol is always available for that purpose, and being easily obtained, is perhaps more serviceable than any other. Bromide of potassium is of high value, but can be used safely only by the physician himself.

(6) F. A. T. asks for any means to prevent hands from perspiring. A. Use the following prescription:

℞. Acid tannic..... ℈ij.
Aqua rosal..... ʒ ss.
Spt. Vin. Rect..... ʒ iiss.
Aquae..... ʒ iij.

M. S. Use as a wash, each night and morning with a soft sponge. The skin should be thoroughly cleansed with soap and warm water and carefully dried and then apply the wash as directed.

(7) J. P. E. writes: I have been troubled for over a year with pimples on my face, what can I do to get rid of them? I have been taking medicines for nearly three months and find no change. A. The pimples are probably an affection known as acne. They are of no consequence except for the unsightly appearance which they cause. They are exceedingly common among young people, and almost invariably cease to show themselves at the age of 20 to 22. Medicines have of course been tried in every available form both external and internal, for the beauty of a smooth skin is too universally prized to allow any neglect of care. But they are of very little service, as the best authorities all agree. Remedies are advertised continually; have nothing to do with them; they will do you no good, and may, on the contrary, injure the skin seriously. For full article on this subject see SUPPLEMENT, No. 542.

(8) S. T. B. asks: What material and process to use in order to give the final or black finish to lenses? A. The finest jeweler's rouge on a pitch lap. Vienna lime is used by some for the last finish, in the same manner as the rouge.

(9) A. A. G.—The soot indicator is used as an indicator of electric currents or of the variations in the intensity thereof. A strip of paper blackened with soot is used to receive the indications, whence its name is derived.

(10) A. H. asks: If it were practicable to use rods of pure iron as carbons in an electric arc lamp, what would be the color of the light? If black oxide of iron was made into rods (as the present carbons are) and used as carbons, what would be the color of the light? A. The light from metallic electrodes would not be so intense or so blue as from carbons, but would resemble it in most respects. The arc would be made very long. The metal would impart no color that would be noticeable. Magnetic oxide has such high resistance that it is hard to see how it could be successfully used for electrodes. If this trouble was surmounted, it would offer further difficulty on account of its fusibility. It would give a long arc similar to that given by metallic iron.

(11) E. A. H.—One of the simplest and best methods of rendering the basement walls of a building damp-proof is to construct on the outside an area wall so that the earth does not rest directly against the main wall of the house, but only against the outside wall or casing of the area. To form such an area, build a wall half or one brick thick parallel to and some 2 or 3 inches from the main wall, and form at the bottom a channel or gutter connected with the drains, so that any moisture or water finding its way in through the outer casing may be conducted away and will not therefore penetrate into the building. Thoroughly ventilate the areas by means of air bricks or other suitable connections with the outer air, and connect with one another by making through connections underneath the floor joists. Be very careful that the main wall is laid on a good and efficient damp course. The top of the space between the area and main walls may be covered in all around the building with bricks—ornamented or otherwise, as preferred—on a line just above the ground. Another plan of effecting the same object is to dispense with the area wall and in building the brick work to cover the whole of the work on the outside with a thick layer of bituminous asphalt. The plaster on the inside is in this case often rendered in nearly neat Portland cement.

(12) H. T. H. asks for a near relative standard amount and size of wire on armature and fields of any dynamo using two field magnets. A. You may figure on obtaining 14 to 49 watts (volt ampere) per pound of copper wire. Any size may be used to produce varying relations of potential and quantity. Edison uses copper bars on the armatures of his large dynamos.

(13) C. W. H. asks: How is the gilding done on watch plates and wheels to produce the color and finish, as they are when new? A. After plating with gold, using the regular solution (cyanide), immerse in a mixture of:

Copper sulphate	3	parts	by weight.
Verdigris	7	"	"
Ammonium chloride	6	"	"
Potash nitrate	6	"	"
Acetic acid	31	"	"

Use solids in powder. After dipping, heat the articles on a plate of copper until they turn dark or black, and then treat with concentrated sulphuric acid. Or instead of above mixture use:

Alum	3	parts	by weight.
Potash nitrate	6	"	"
Zinc sulphate	3	"	"
Sodium chloride	3	"	"

Use as a paste; coat articles with it, heat on iron plate until they turn black, and wash with cold water. 2. What is the process used to plate silver on iron or steel, such as table knives, for instance? A. After cleaning steel with greatest care, plate with thin adherent coating of copper, and silver plate on that. 3. What would be the power of an electric motor made with six ten-inch permanent magnets and a 12 by 4 inch armature wound with three pounds of No. 14 wire and 12 gravity batteries? A. Probably not over $\frac{1}{12\frac{1}{5}}$ to $\frac{1}{15\frac{1}{0}}$ of a horse power.

(14) J. D. asks: 1. In making the dynamo electric machine in SUPPLEMENT, No. 161, three or four times larger than the description there, should the wire be also increased in thickness? If so, in what proportion? A. Increase the size of wire in same lineal proportion, *i. e.*, if machine is twice as large, use wire of double diameter. This is a general rule only; the thickness of wire for any machine would depend on the class of work it was to do. 2. Is soft gray iron best for both armature and magnets? A. Soft gray iron is the best kind of cast iron for the armature and magnets. 3. In making carbons described in SCIENTIFIC AMERICAN, April 10, which would be the best—coke or gas retort carbon; and would it be as good as a pure carbon plate? A. In general terms, the purer the carbon, the better. Coke we should give the preference to. It would be difficult to pulverize retort carbon sufficiently. 4. Could a wire be cast in it that would make a good connection? A. You could not cast a wire in it. You could drill and ream a slightly conical hole in its top, and force in a tapering plug with wire attached, or dip top of carbon in melted paraffine, plate it with copper, and clamp wire to that. 5. Are the carbons in the arc light made in this way? A. Arc light carbons are in general terms so made, but with differences in detail. Coal tar is sometimes used instead of sirup. In igniting the carbons, they should be covered with carbon or coke dust and protected from the air.

(15) M. B. asks how to connect a wire to a chloride of silver electrode. A. Melt the chloride of silver, and cast it in a mould around a flattened silver wire.

(16) J. W. W. asks: Can I deposit iron with the batteries, and how? A. You can do so by following method, as used in nickel plating. Dissolve clean iron wire in hydrochloric acid, using enough wire to leave a little undissolved. Then for every 60 parts of iron dissolved add 55 parts ammonium chloride, and a little glycerine may be added. Consult H. Fontaine, Electrolysis, price $3.50, which we can furnish. 2. How can I make an electro magnet capable of raising about 200 pounds from a distance of 6 inches from the poles, and how many gravity cells will I require? A. You would require a magnet of enormous power. Thirty or forty gravity cells might run it. Your only practicable way would be to extend the pole pieces and have the armature play between them, or to use a hollow core or axial magnet. See Du Moncel on Electro Magnets, price 75 cents, which we can furnish; also SCIENTIFIC AMERICAN, February 13, 1886.

(17) J. N. asks how to become an electrician. A. Try to get employment at any terms in some neighboring electric light factory or plant, and read standard works on the subject. A good course in the subject at college, as at Ann Arbor, Michigan, or Cornell University, Ithaca, N. Y., would be of great value.

(18) J. F. M. says: I wish to know how to fix a piano cover. It is made of rubber, and coated on the outside with a green flock. Now, I wish to flock it again. What must I use, so that it will still be pliable? A. Coat the surface with a glue, made by dissolving pure rubber in benzine, and while tacky, apply the flock.

(19) M. J. asks concerning weight of hay. A. According to Haswell, loose hay weighs 5 pounds to the cubic foot; pressed as in stack, 8 pounds; close pressed as in bale, 12 to 14 pounds. Hence, for hay in stacks you should allow about 280 feet for a wagon load of 450 to 500 cubic feet, because in its transfer to the wagon it will be considerably lightened.

(20) T. H. H. says: I observe that some at least of the ordinary batteries, with induction coil, for medical use, represent the secondary or induced current as having definite polarity like the primary. Is this not incorrect, and is it not a "to and fro" current, or is there a modification made of it? A. Its polarity varies, constituting a "shuttle current." 2. In what respect, if any, is the induced current alluded to different from that from a magneto-electric machine? A. It is the same in general as to its effects, but possesses more quantity and less intensity.

(21) J. B. B. asks: 1. Is the use of brass spigots in drawing beer or porter injurious. If so, what would be the best kind to use? A. They have been condemned by good authorities, and lining with block tin is recommended. 2. Cannot ale or stale beer be "doctored" in such a manner as to be palmed off for porter? If so, how? Is quassia bark and caramel ever used? A. We are not authorities on "doctoring." 3. Are there not substitutes for malt, in the manufacture of ale, beer, etc.? Is rice ever used? A. Glucose is a substitute for malt. Rice malt may be used.

(22) J. W. P.—We are not familiar with the exact formula of the laryngeal lozenges you ask about, but Wistar's cough lozenge, which is of the same character, is prepared by mixing gum arabic, extract of licorice, and sugar, of each 2½ ounces, powdered opium 1 drachm, oil of anise seed 40 drops, for 60 lozenges. One, three or four times a day.

(23) W. L. J.—Flowering plants may be kept over winter by packing their roots in a box of sand in a cellar; bulbs, by hanging in bunches in a cellar.

(24) C. N. Y. writes: I have a marble statue to repair. It is 3 feet high, and the feet are broken off. Can you inform me of a good cement that I can cement it with, or what do they cement marble together with? A An excellent cement for your purpose can be made by adding to ½ pint of skimmed milk ½ pint of vinegar. Mix with this the whites of 5 eggs well beaten; then sift in with constant stirring sufficient powdered quicklime to form a paste.

(25) J. W. G.—The water of condensation in steam pipes can be returned to the boiler only by gravity, which requires that the water line in the boiler should be below the level of the coils or pipe work. This is common practice in steam heating. The exhaust from the engine can only be partially returned to the boiler by an exhaust injector (a new device). The water from steam heating pipes below the level of the boiler can be returned to the boiler by a device called a "return steam trap."

(26) J. P. D. asks (1) the kind of iron that should be used in the construction of spoke wheels for a light hand car. A. Make rim and hub of cast iron with wrought iron spokes (⅝ round iron notched and headed at each end) laid in the mould. Make the frame of wrought iron and wood. 2. Which is best to propel a hand machine—a chain belt, such as is used on trycicles, or ordinary cog wheels? A. Flat link is best.

(27) C. S. S. asks whether annealing boiler flues is an injury or not. A. Boiler makers sometimes anneal the ends of tubes for one or two inches when they are found to be brittle. The practice is not recommended. The trouble of split ends often arises from boring the holes in the tube sheet too large. Annealing the ends softens the iron, increases the scale, and shortens the life of the tube at the points that it wears the fastest.

(28) Inquirer asks (1) what chemical preparations will render fabrics fireproof or incombustible. A. You will find several recipes for rendering fabrics incombustible, in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 245. 2. If asbestos is soluble, and if so in what proportion. A. There are several varieties of asbestos, none of which are entirely soluble, but some of them are slightly acted upon by the stronger acids.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

J. M. H.—The specimen has the appearance of being pipe clay. On account of the nearness of excellent qualities of clay in New Jersey, it would have no commercial value in New York. Nothing positive as to its application could be given unless it was first tested in a potter's kiln.—A. B.—The specimen appears to be infusorial earth, and is useful in polishing metal surfaces, etc. It would be impossible to find a market for it in any city, as the supply already exceeds the demand. It is well known under the trade name of electro-silicon. J. S.—The rock is simply limestone. It leaves little or no residue on treatment with acid.

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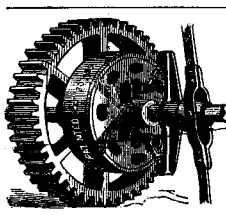
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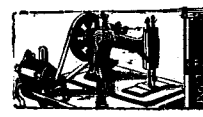
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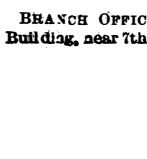

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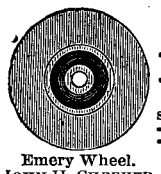

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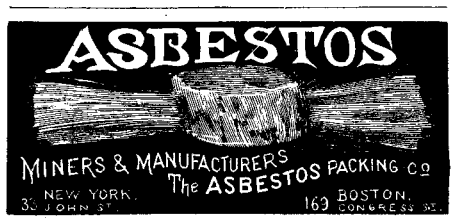

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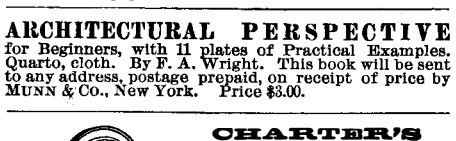

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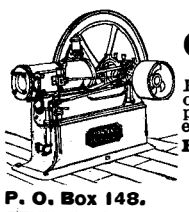

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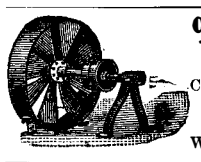

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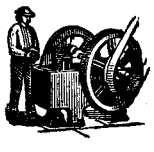

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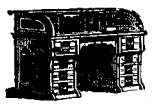

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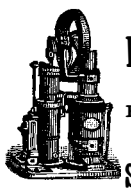

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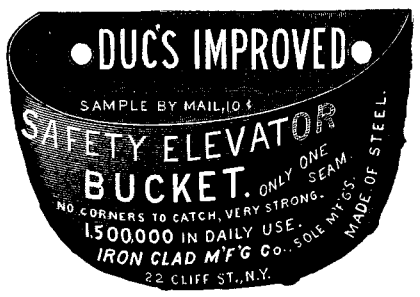
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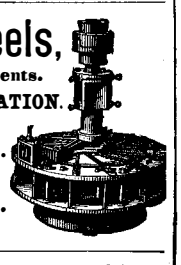

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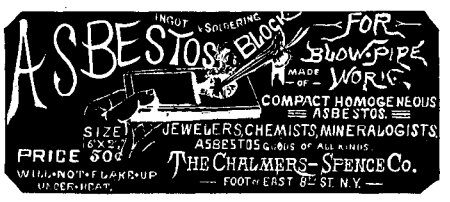

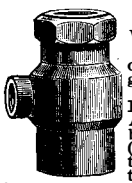

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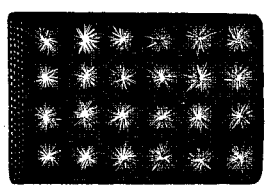

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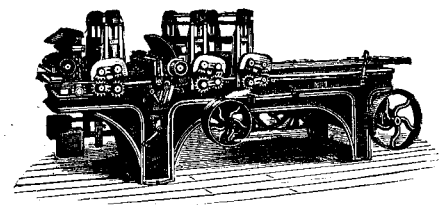

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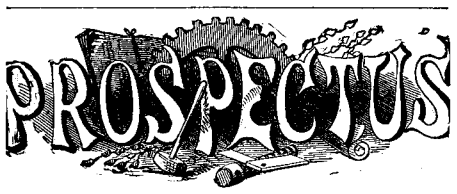

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